Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

MARCH 1955

"A LARGER MEASURE OF SAFETY FOR AMERICA'S MINES"

ROOF-FALL ACCIDENT CAMPAIGN: A national campaign is being undertaken in 1955 to reduce accidents and injuries from fall of roofs in coal mines. Cooperation of coal mine management, employes, State departments of mines, national and local coal associations, the United Mine Workers, editors of coal publications, safety organizations, compensation insurance carriers, and the U. S. Bureau of Mines is being sought in an effort to bring about a sharp reduction in such accidents.

Details of the campaign will be made known throughout the industry shortly.

ROOF-FALL ACCIDENT CAMPAIGN—
WILL HELP REDUCE ACCIDENTS, INJURIES

Patents Applied For

Top view of shell showing the protective knock-out disc

With 60 percent of coal mine accidents directly traceable to roof falls—resulting in injuries and production delays—it is very fitting that industry-wide action—on a national and local level—should be directed towards a reduction in roof falls. In recent years roof bolting has spread like few other major advancements in the history of mining and is recognized today as the best type of roof support. The PATTIN MFG. COMPANY, being the largest exclusive manufacturer of roof bolting products, offers its services and products to all coal mining companies that contemplate a roof bolting program. The products are as illustrated and described.

EXPANSION SHELLS—the largest and most complete line of 2, 2½ and 3-inch length shells—having double the expansion of other shells—is featured by the new "D-2" (fool-proof and trouble-free) shell. The bail in the "D-2" was designed to let the bolt pass through by pushing the new knock-out disc out of the bail—eliminating accurate location of the bolt in the wedge nut before inserting in the bore hole. The disc keeps sand and other cuttings from getting into and fouling-up the threads of the wedge nut. PATTIN shells are the easiest to install and give the strongest and safest anchorage possible.

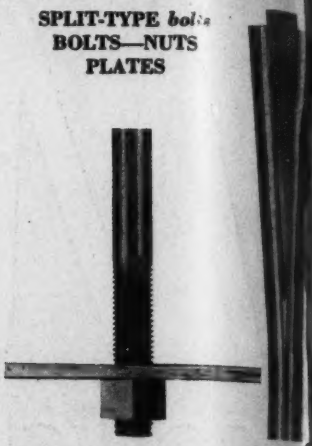
SPLIT-TYPE BOLTS—Full 1-inch in diameter with cut threads—in all lengths.

BOLT HEAD—a self centering head that centers plate washers and reduces handling and installation time and costs.

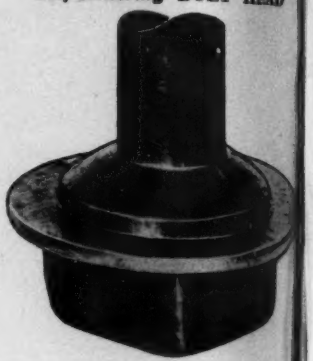
BOLTS-PLATES—A complete stock of all sizes and shapes.

SHIPPING TUBES—Protect all PATTIN shells against shipping damage and prevent loss of parts. Easily removed from shell.

SPLIT-TYPE *bolts*
BOLTS—NUTS
PLATES



***Self-centering* BOLT HEAD**



***Protective* SHIPPING TUBE**

PATTIN

"The Pioneer in Roof Bolting"

Est. 1888

MFG. COMPANY
Marietta, Ohio

Now···GUARTEC Cuts Filter "Down-Time"

New Gum Colloid Offers Drier, More Porous Filter Cake

A Natural Vegetable colloid, Guartec effectively flocculates fine particles before filtering. As shown in the illustration at left, Guartec quickly agglomerates the fine particles . . . allows filtrate to drain off . . . keeps particles from packing down and plugging the filter during filtration.

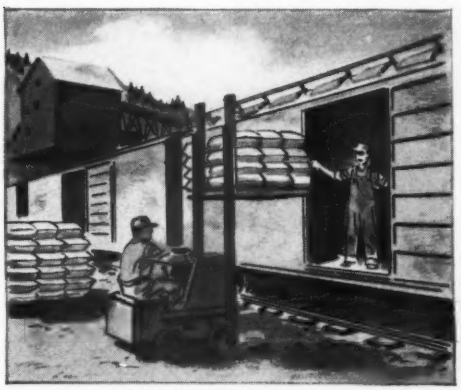
This efficient agglomeration speeds up your filtration rate and gives you a drier, more porous filter cake. Therefore, your filter capacity increases, and filtration operations accelerate. Guartec sols can be made continuously to keep up with the most rapid continuous filtration process.

NOW AVAILABLE IN COMMERCIAL QUANTITIES

To get your concentrate faster and cheaper, try Guartec, the new colloid for mineral flocculation and filtering. For Guartec "flocs" quickly and completely—joins fine ore particles into a loose mass that resists packing down and plugging the filter. More than two years of test results show that Guartec:

1. **Improves mineral recovery**
2. **Cuts the frequency of plant "down-time"**
3. **Speeds production rate**
4. **Permits greater production with same equipment**
5. **Features wide stability under varying pH and temperature conditions**

Guartec is available, immediately . . . in commercial quantities. When you lay out your flow sheet to include Guartec, you can depend on us to keep you in supply of this chemical—and that each batch will work exactly like the last . . . and the next.



Prompt Shipments at a stable price are offered by Guartec. Commercial quantities can be shipped immediately. Guartec comes to you packed in 100-pound bags lined with moisture-protective pliofilm. Besides protecting against moisture deterioration under all weather conditions, this smooth pliofilm lining does away with "holdup" in the bag . . . makes Guartec easier to handle in your plant.

GUARTEC USES

Besides its success in filtration, Guartec also works well as a flocculant for faster ore settling, as a clarifying agent for waters and brines, and as a blinding agent to save on expensive collectors in froth flotation.

Guartec proves effective whether the essential mineral is floated or obtained from the tailings. It can be used wherever beneficiation is practiced and flocculating problems exist.

Let us help improve your flocculating and filtering. We can send you a Guartec sample and technical information by return mail. You'll find that Guartec is efficient . . . versatile . . . readily available. And its low cost per ton of ore produced will please you greatly.

FOR SAMPLE, PRICES AND TECHNICAL DATA, MAIL THIS COUPON

MAIL TO **General Mills**

Special Commodities Division

MINNEAPOLIS 1, MINNESOTA

Please send me a sample and further information about Guartec for_____

_____

Name_____

Firm_____

Address_____

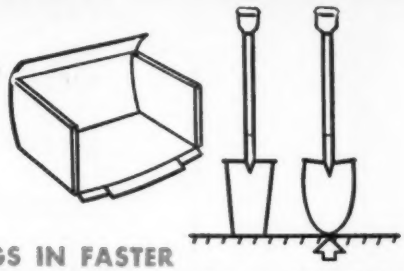
City_____ **Zone**_____ **State**_____

5 BIG REASONS WHY ALLIS-CHALMERS move more dirt at

Watch an Allis-Chalmers scraper at work and you'll see that it loads bigger — travels and maneuvers more easily — puts more dirt right where you want it with the least tractor effort. Check features and you'll understand *why* an Allis-Chalmers scraper is able to outperform others. Then compare prices and you'll see that it gives you more scraper capacity per dollar — more for your money in every way.

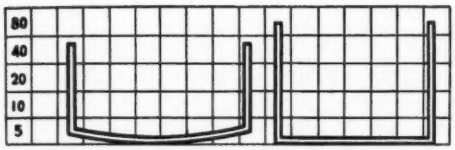
INTRODUCING THE AC-108, newest scraper in the Allis-Chalmers line — shown here with an Allis-Chalmers HD-15 Tractor. Has 8.4 struck capacity (11 yd heaped). Incorporates all of the big-yardage features that have been job-proved in the other Allis-Chalmers scrapers, 2 to 18 yds heaped capacities.

SCRAPERS
lower cost



1 DIGS IN FASTER

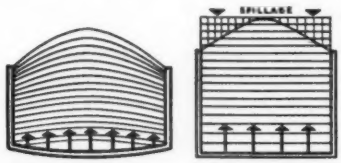
Curved and offset cutting edge on Allis-Chalmers scrapers concentrate all the tractor horsepower on the center section during initial penetration. The penetrating ability of a round-end spade helps illustrate the soundness of this Allis-Chalmers design.



2 LESS LOADING RESISTANCE

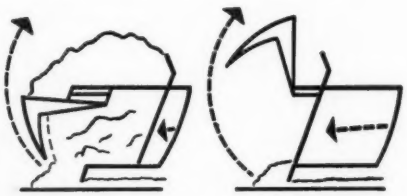
Low, wide bowl plays an important part in ease of loading. Since loading resistance is largely determined by the height to which the load is built, the lower, wider bowl of an Allis-Chalmers scraper requires less time and power to get the same yardage as other scrapers.

Diagrams show how an automatically heaped load avoids costly spillage even though the center is built up above the sides of the bowl.



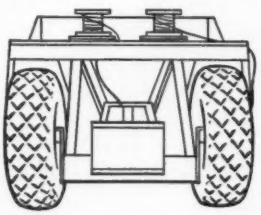
3 HEAPS AUTOMATICALLY

The combination of slightly deeper center cut and correctly angled cutting edge shapes the load as the scraper fills. The greater volume of dirt flowing into the center of the curved bowl "boils" forward, to the rear and to the sides, pulverizing the dirt, filling the voids and producing an automatically heaped load without excessive spillage.



4 POSITIVE EJECTION ASSURES EVEN SPREADING

With patented linkage, apron lifts, then moves forward and up as ejector pushes foward. High apron lift prevents any possibility of material's jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected. Ejector returns to loading position automatically by spring action and apron weight.



5 HAULS, MANEUVERS EASILY

Big, low-pressure tires provide maximum flotation. The extra wide, low bowl keeps center of gravity low, helps the scraper hug the ground for safety. Front running gear has ample clearance at all points, high carrying position clears uneven ground.

Scraper main frame is shorter because exclusive linkage moves apron forward as well as upward to clear main frame at full height. The two-to-three feet shorter wheel base permits easier maneuvering. Scraper can turn in its own length.

• • •

There is an Allis-Chalmers pull-type scraper for every tractor . . . every job. Write for literature or contact your Allis-Chalmers dealer.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Flamingo Mine uses

CALUMET

Viscous Lubricant for Marion dragline spur gear

A No. 7200 Marion dragline at Flamingo Mine, Fairview, Illinois, is a busy piece of equipment. Its jobs include removing overburden and laying fill for roadbeds. These are rugged chores carried on in all kinds of weather under tough operating conditions. To keep this dragline operating winter, summer, spring, fall, in dust, dirt, and mud, Flamingo Mine lubricates the vital spur gear with CALUMET Viscous Lubricant.

CALUMET Viscous is an adhesive lubricant manufactured specifically for such tough service as this spur gear job. It will not chip off in winter temperatures nor throw off during summer heat. It has the ability to withstand heavy shock loads, has high load carrying capacity. Its unique properties make it both heat and water resistant.

CALUMET Viscous Lubricant can be applied, without heating, by either gun, brush or swab, without scraping off previously used lubricants – two important advantages.

There is a complete line of CALUMET Viscous Lubricants. They are just a few of the extensive catalog of greases and lubricants available from Standard Oil. Like to know more about them? In the Midwest call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Ill.

Marion dragline at the Fairview Collieries, Inc., Flamingo Mine, Fairview, Illinois, lays fill for new coal road. Dragline uses Standard greases.

R. E. Wright, Standard lubrication specialist, inspects Marion dragline spur gear. Before entering field service work Bob got his engineering degree from Michigan School of Mines. He has completed Standard's Sales Engineering School. Customers find this background and experience pay off for them.

STANDARD

STANDARD OIL COMPANY
(Indiana)

MARCH, 1955

VOLUME 41 • NUMBER 3

Mining

CONGRESS JOURNAL

CONTENTS

FRONT COVER: At White Pine Mine in northern Michigan crawler-mounted drill jumbo moves to face through 8 by 24-ft. drifts

EDITORIALS 23

MINING AND MILLING AT WHITE PINE 24
By HAROLD B. EWOLDT

MINING AT POWHATAN NO. 1 27
By GEORGE W. SALL

HANDLING MATERIALS AT LARK 33
By H. H. WELLS

BLAINE MINE NEARS END 36

THE CONNECTING LINK IN PERCUSSION DRILLING 42
Mechanical Treatment of Drill Steel
By FLOYD R. ANDERSON

Control—The Payoff
By R. J. MARCOTTE

1955 COAL SHOW 48

BRITAIN'S POWER PROBLEM 54

PACKAGED POWER 56
By R. G. GEHLSEN

MINING MACHINE MOTOR IDENTIFICATION 58
By F. R. HUGUS, J. A. BUSS AND E. L. PARKER

OPERATING PROBLEMS AT YERINGTON 62
By H. R. BURCH

WHEELS OF GOVERNMENT 66

PERSONALS 68

NEWS and VIEWS 70

MANUFACTURERS FORUM 81

Editorial Director
JULIAN D. CONOVER

Editor
JOHN CAMERON FOX

Assistant Editor
GEORGE W. SALL

Associate Editors
G. B. SOUTHWARD
H. L. MOFFETT
P. D. McMURRER
W. I. POWELL

•

Production
B. C. WILKERSON
J. J. WARD

•

Advertising
P. D. McMURRER
Manager
FRANK W. MORAN
Chicago
RALPH F. DUYSTERS
New York City
RALPH W. HARKER
Los Angeles and San Francisco

•

Circulation
M. D. TAYLOR

Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

Indexed regularly by Engineering Index, Inc.

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Copyright 1955, by

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG
President
WORTHEN BRADLEY
Vice-President
ANDREW FLETCHER
Vice-President
RAYMOND E. SALVATI
Vice-President
JULIAN D. CONOVER
Exec. Vice-President and Secretary

Member
Audit Bureau of Circulation

ELIMINATE TIME-WASTING DRILL STEEL CHANGES!

You can quickly interchange both TIMKEN® rock bit types on the same drill steel—right on the job

TIMKEN® multi-use and carbide insert bits eliminate the time wasted in going after a different set of steels whenever bit types are changed. Timken rock bits are interchangeable. Dozens of different bits fit the same drill steel. And it takes only a minute to unscrew one type of Timken rock bit and screw a different type bit on the same drill steel.

With Timken rock bits, your men can quickly switch to the most economical bit as the ground changes—right on the job. And because dozens of different Timken multi-use and carbide insert bits fit the same drill steel, you don't have to carry a large drill steel inventory.

Both Timken multi-use and carbide insert bits are made from electric furnace Timken fine alloy steel. And their special shoulder union keeps drilling impact from damaging the threads.

If you have a drilling problem, call our rock bit engineers. They'll be glad to help you. And there's no obligation. Just write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be used.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

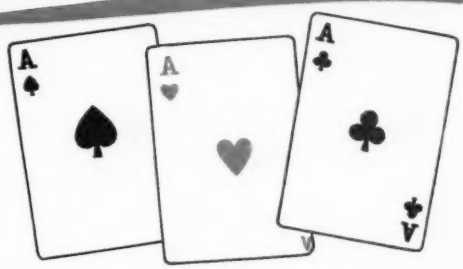
Give highest speed through hard, abrasive ground. Also most economical for constant-gauge holes, small diameter holes, very deep holes.

... your best bet for the best bit... for every job

TIMKEN

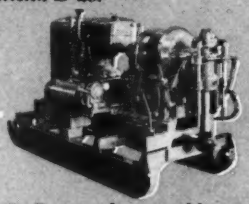
TRADE-MARK REG. U. S. PAT. OFF.

When you're CORE-DRILLING, it's no gamble with these 3 aces in the hole



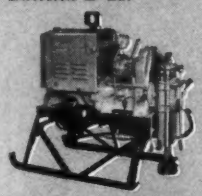
22-HD The rugged, heavy-duty model. Capacity—2000' with EX fittings. Also available as truck-mounted drill or on twin-column mount for underground operation. Bulletin D-28.

1



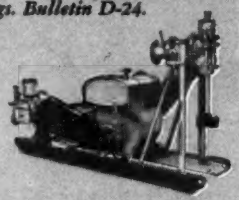
12-B Extremely portable, weighs approximately 1200 lbs. Capacity—1000' with EX fittings. Also available on twin-column mount with air motor drive for underground operation. Bulletin D-21.

2



No. 7 The lightweight, easily transportable model. Can be taken underground or transported by airplane, boat, or even muleback into remote areas. Capacity—500' with EX fittings. Bulletin D-24.

3



CONTRACT CORE DRILLING *Sub-surface test borings for mineral prospecting, foundation drilling, and grout hole drilling are available on a contract basis. Highly skilled crews and complete stock of core drills, bits, and accessory equipment are maintained at all times.*

JOY Diamond Core Drills When these three "aces" go into the holes, luck no longer is a factor. They are a sure bet to tell you exactly what is down there. And, at Joy, you can find the right "ace" to do the best job for you.

With maximum capacities ranging from 500 to 2000 feet, there are Joy diamond drills applicable to almost any coring job. And they'll do the best job for you. Here's why . . .

EXTREME PORTABILITY Skid mountings, compact design, and rugged construction make it possible to drag Joy diamond drills into some of the most inaccessible locations.

VERSATILITY Because they are available with either hydraulic or screw-feed swivelheads and with a choice of gasoline, electric or air power, Joy core drills can fit into any drilling program without expensive preparations.

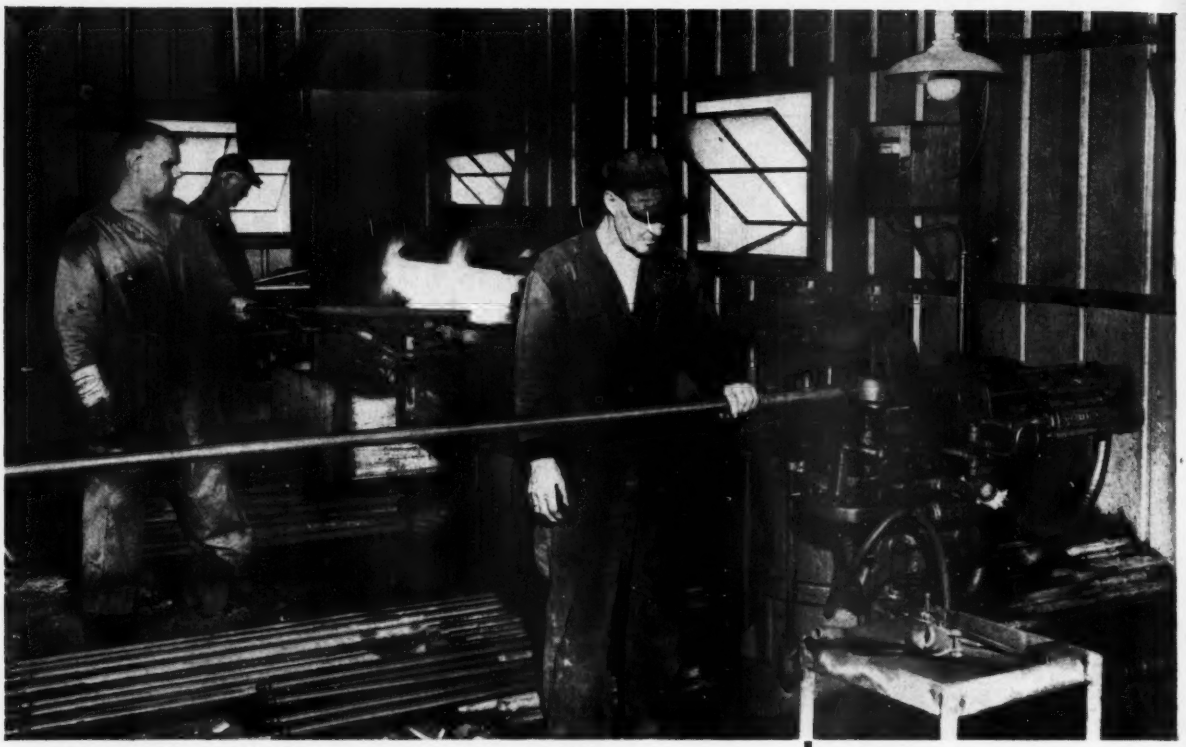
Check your drilling needs against this group of outstanding drills. One of them will be suitable to your needs and it will do an accurate, economical job of proving the mineral value of your property. Write today for literature on the machine you need to **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

W&D M5508

JOY

WORLD'S LARGEST MANUFACTURER OF CORE DRILLS AND MOTORIZED DRILL RIGS SINCE 1851



Blacksmith Billy Watkins shanking a Crucible Hollow Drill Rod.

they're using Crucible Hollow Drill Rods on the Boston Tunnel Jobs . . .

400-feet below the city of Boston, two seven-mile tunnels are being cut through solid rock. Replacing century-old mains, the tunnels will bring water from Quabbin Reservoir, 70 miles away, and remove drainage from the city.

On this job, like most other tough ones, Crucible Hollow Drill Rods are in daily use. For experienced construction men *know* they can depend upon Crucible Hollow Drill Rods for top performance at *lowest cost per foot of hole drilled.*

That's because they are made to *tool steel* standards by the nation's leading producer of *special steels.* So for *extra* dependability on *all* your drilling jobs specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

120-foot-high head frame used to raise and lower men and materials in excavation shaft. Morrison-Knudsen-Kiewit-Maney City Tunnel Extension Job, Boston, Mass.

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

GM DIESEL
CASE HISTORY No. 5310-109

USER: Certain-Teed Products Corporation, Grand Rapids, Michigan.

INSTALLATION: GM "3-71" Diesel drives 250-volt generator powering Joy shuttle car in underground gypsum mine. Scrubber used on exhaust.

PERFORMANCE: Unit working up to 15 hours a day hauling ore up 12% grade to crusher. Fuel cost--$1.70 per day. Maintains full speed all day long instead of slowing up after 5 or 6 hours as their battery-powered cars do. Plant engineer Art Lund says GM Diesel-powered unit is "more economical than we planned on."

It Pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

FULL HAULING POWER
All Day Long

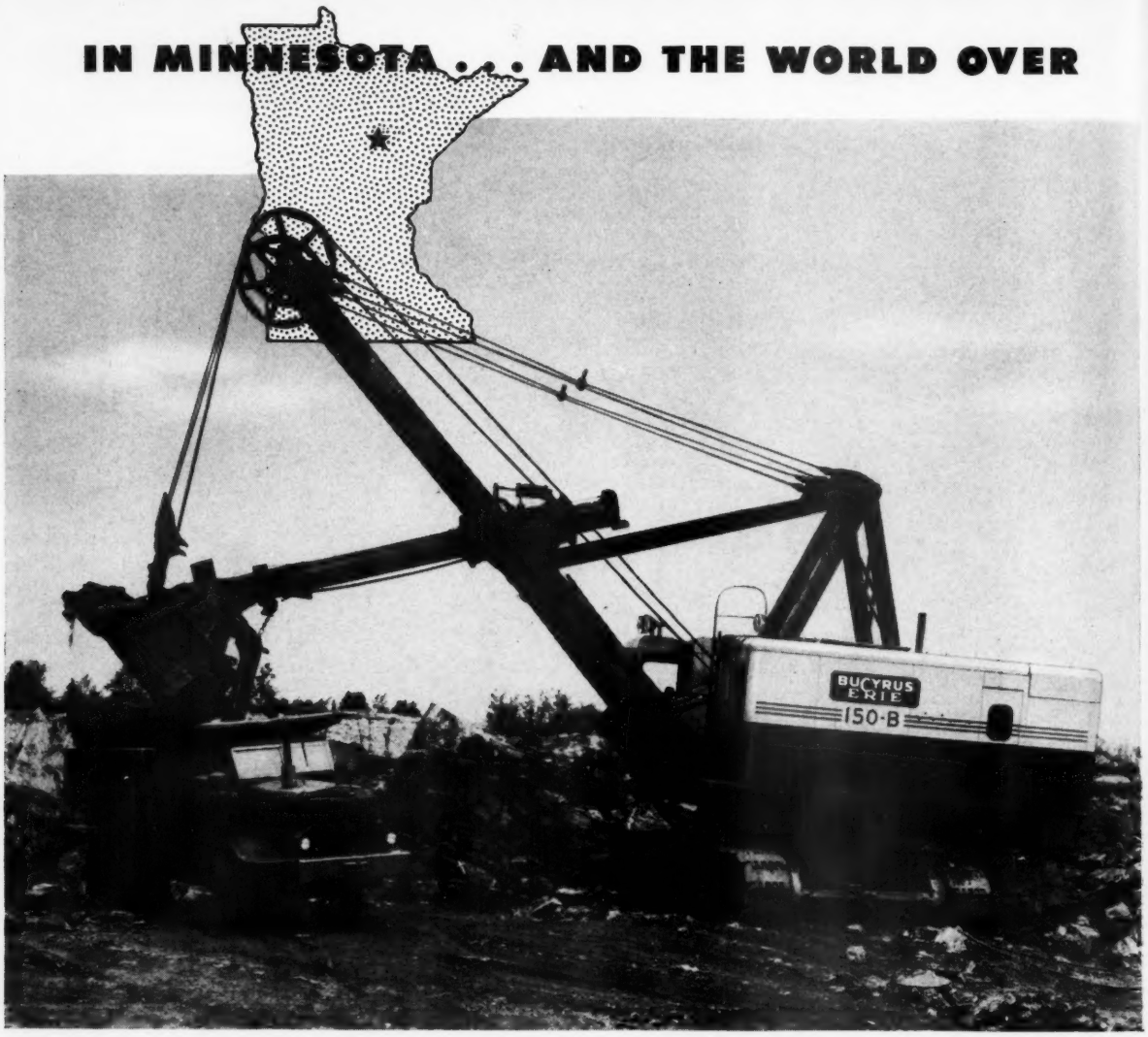
"Hauls faster—better than batteries—never lags on 12% grade," reports the operator of this General Motors Diesel-powered shuttle car. There are many reasons why!

In GM Diesel power you get a fast-accelerating 2-cycle Diesel that packs more power in a smaller, lighter engine—fits where other engines won't. Its Uniflow blower forces more air per stroke into the cylinder, helps give better fuel economy and cleaner exhaust. Simple unit injector system precisely matches fuel input to load requirements, eliminates troublesome high-pressure fuel lines.

Before you buy a Diesel, check parts costs, too. For example, GM Diesel valves cost up to 62% *less* than valves for other Diesels of comparable power. And when parts *are* needed, a world-wide network of GM Diesel distributors supplies fast service and quick delivery. For full details on economical GM Diesel power for your mine, call your distributor or write direct.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines...30 to 300 H.P. Multiple Units...Up to 893 H.P.

IN MINNESOTA . . . AND THE WORLD OVER

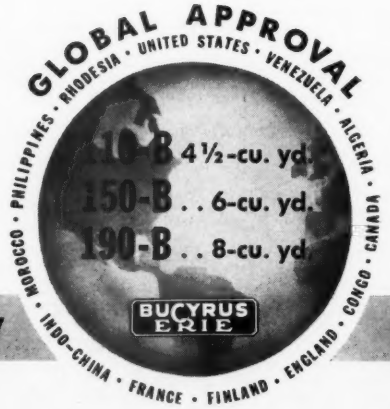


Rock meets its master

WITH A BUCYRUS-ERIE SHOVEL ON THE JOB

On the Mesabi Range, this 150-B shovel is loading out rocky overburden, delivering outstanding output. This performance story is being repeated daily in mines, quarries and on heavy-duty construction projects throughout the world.

New front-end design, extra-strong construction, and advanced engineering of Bucyrus-Erie Ward Leonard electric excavators give owners *that extra margin* of output that pays off in profits. 27L54

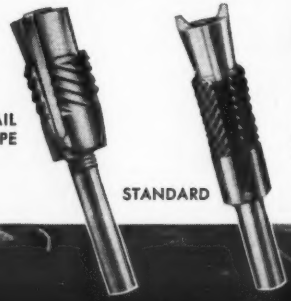


Bucyrus-Erie Company

South Milwaukee, Wisconsin

Bail Type or Standard

O-B Shells and Plugs in Average Top
Will Exceed the Strength of the Bolt



Ohio Brass

MANSFIELD OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

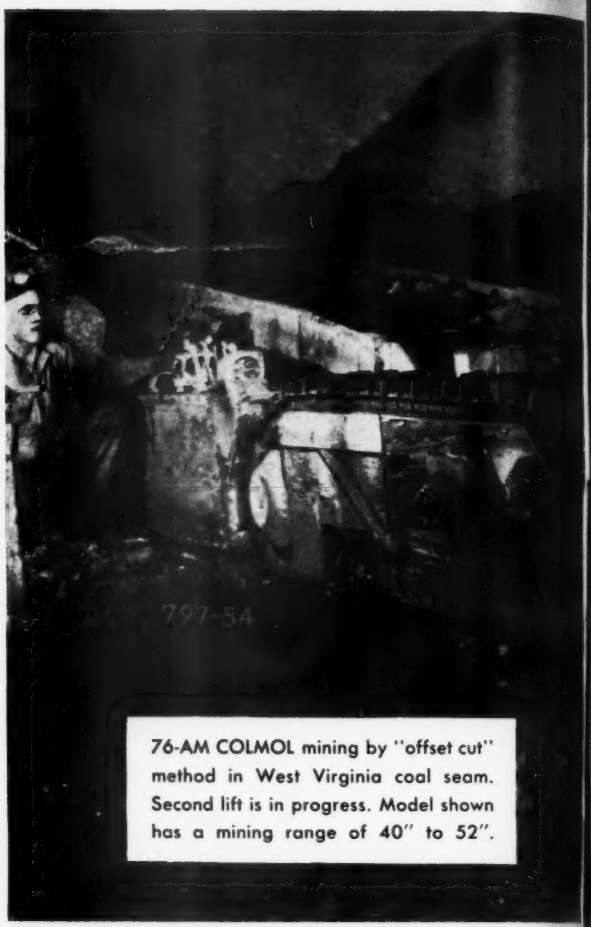
Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4586-M

a mighty 'mole' for low-vein coal...

JEFFREY 76-AM COLMOL

PATENTED



76-AM COLMOL mining by "offset cut" method in West Virginia coal seam. Second lift is in progress. Model shown has a mining range of 40" to 52".

The rugged 25-ton 76-AM COLMOL keeps digging and advancing continuously . . . so flexible it can turn in its own length . . . operates with little noise or vibration.

The outstanding ease of operation is apparent in the view immediately above which shows the COLMOL loading into a shuttle car. Once set, the controls need little attention . . . greatly reduce operator fatigue. The operator is in a protected location 20 feet from the face. Duplicate controls permit choice of more accessible side for operating.

Overlapping breaker arms (see large photo) rotate at less than 60 RPM—a relatively slow speed which minimizes fines and dust. Arms sweep inward enabling conveyor to pick up loose coal. Upper row of breaker arms can be raised hydraulically as much as 12" to allow for varying seam thicknesses. Entire head can be raised, lowered or tilted to follow rolls.

The powerful 76-AM COLMOL mines up to 80 tons per man-shift in coal seams as low as 38". Its tonnage record in prominent coal mines challenges comparison with any other continuous-type mining machine!

The 76-AM COLMOL advances continuously into a solid seam, removing all coal from an area 9'8" wide by 38" high and upward. It eliminates the need for three separate operations of cutting, drilling and loading, by simultaneously mining and loading coal without the use of explosives.

Here are just four of the COLMOL'S advantages: ✻ One compact machine does the work of several "conventional" machines. ✻ High productive capacity per man lowers mining cost per ton. ✻ Screen analyses show that in many cases the COLMOL mines coal comparable in size composition to that produced by "conventional" mining. ✻ Long wide crawlers with cleats enable it to operate over almost any bottom condition.

Learn more! Write for new COLMOL Bulletin 877.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

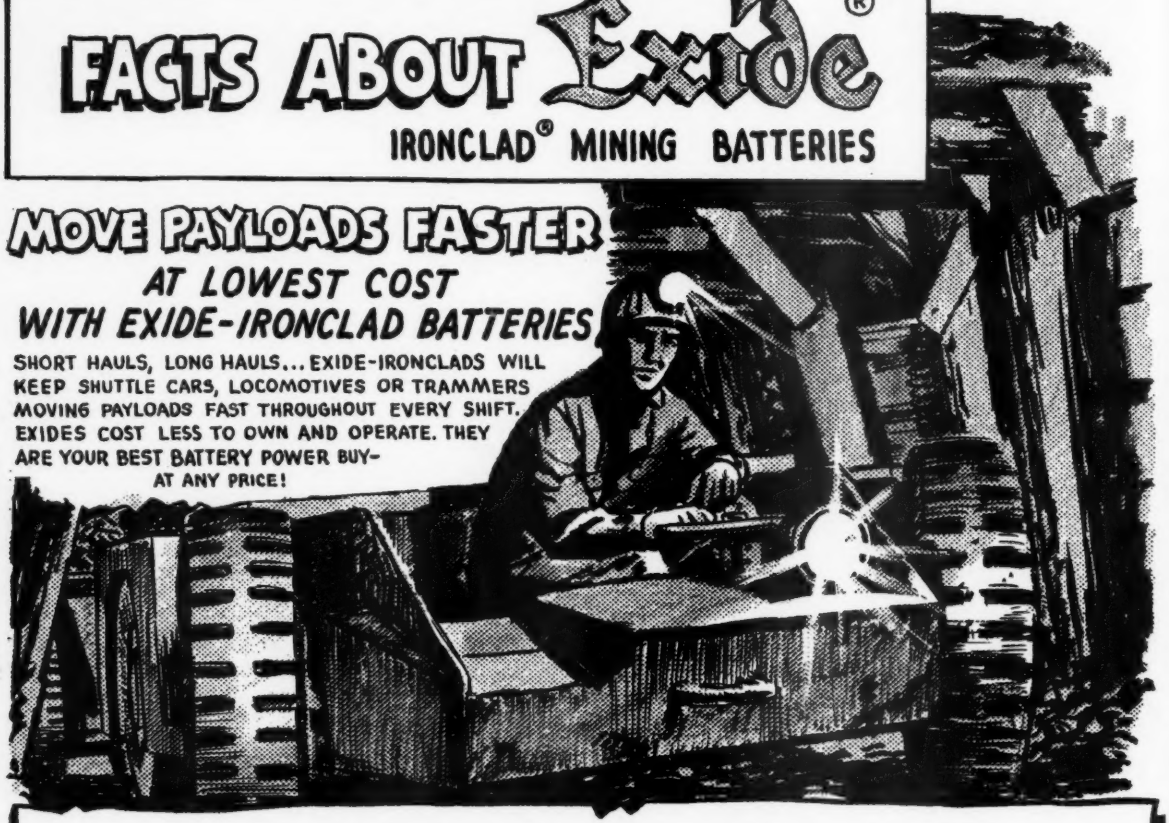
IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!

FACTS ABOUT Exide®

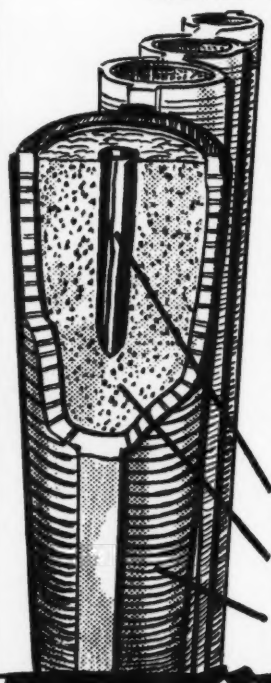
IRONCLAD® MINING BATTERIES

MOVE PAYLOADS FASTER
AT LOWEST COST WITH EXIDE-IRONCLAD BATTERIES

SHORT HAULS, LONG HAULS... EXIDE-IRONCLADS WILL KEEP SHUTTLE CARS, LOCOMOTIVES OR TRAMMERS MOVING PAYLOADS FAST THROUGHOUT EVERY SHIFT. EXIDES COST LESS TO OWN AND OPERATE. THEY ARE YOUR BEST BATTERY POWER BUY— AT ANY PRICE!



NATURE'S IDEAL SHAPE
THE CIRCLE WORKS FOR YOU INSIDE AN EXIDE-IRONCLAD



SLOTTED TUBES INSIDE AN IRONCLAD KEEP ACTIVE MATERIAL IN FIRM CONTACT WITH CONDUCTING GRIDS OF THE POSITIVE PLATE... THIS GRID PROTECTION LENGTHENS LIFE OF BATTERY. THE SLOTTED TUBES EXPOSE MORE ACTIVE MATERIAL TO THE ELECTROLYTE... FOR GREATER POWER. FINE TUBE SLOTS HOLD MATERIAL IN CONTACT WITH GRID LONGER... RESULT, THE IRONCLAD'S ABILITY TO DO YOUR MINE HAULAGE JOB FOR A LONGER PERIOD OF TIME. THAT IS WHY

EXIDE-IRONCLADS

ARE YOUR BEST MINING BATTERY BUY—

AT ANY PRICE!

IRONCLAD POSITIVE PLATE

LET EXIDE HELP SOLVE YOUR MINING BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

NEW "KING-SIZE" CARTRIDGES SAVE TIME AND LABOR

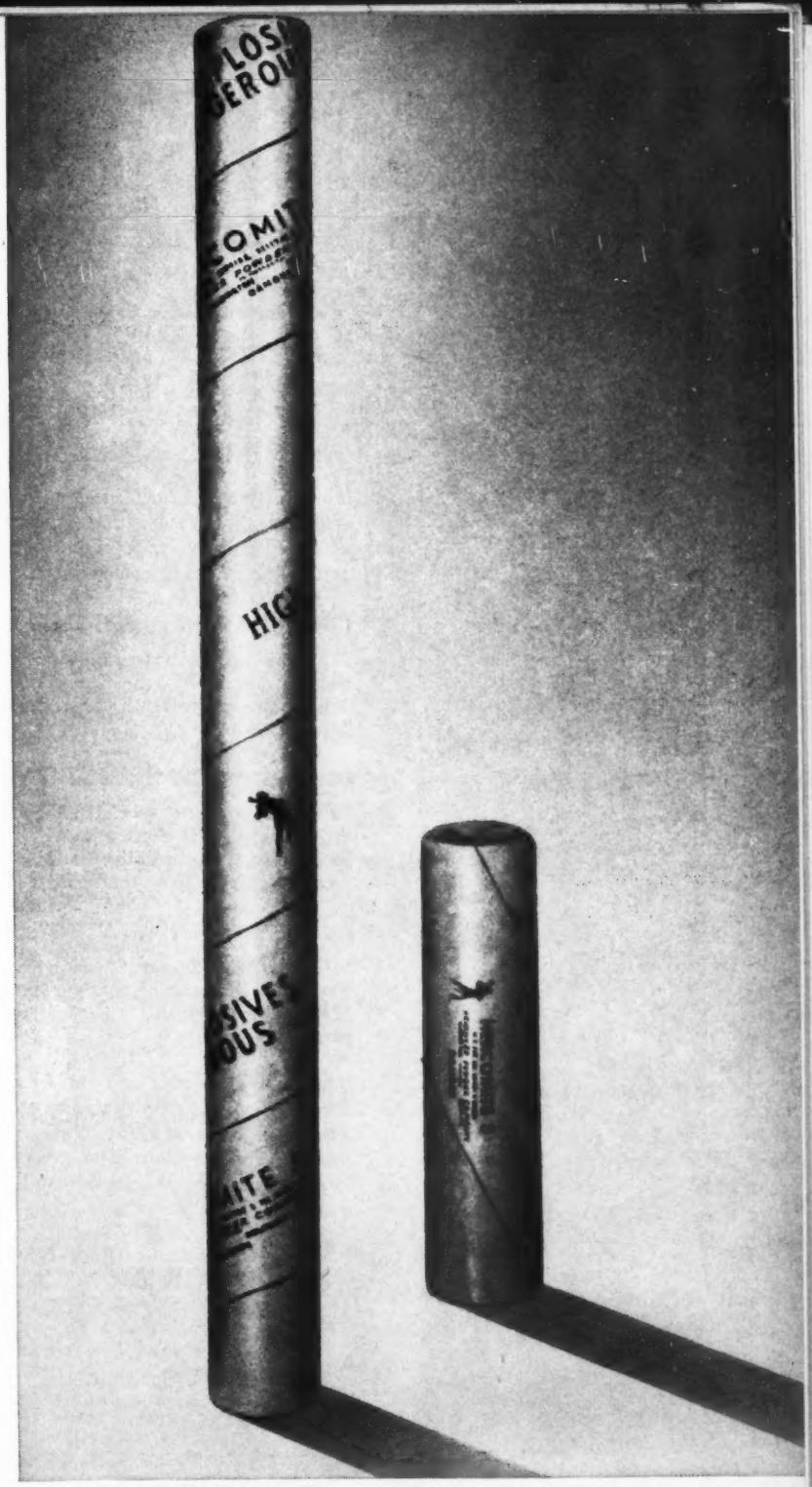
Now, Hercules produces "King-Size" cartridges in lengths of 24, 20, 16 and 12 inches, and in diameters of 1¼, 1½, 1¾, and 2 inches.

Available in all types of Hercules® dynamite, these long-length, small-diameter cartridges are now in full production.

"King-Size" cartridges make possible a more uniform fragmentation through the discharge of a single column of explosive. Their use means substantial savings in valuable time and labor in loading holes.

Hercules designed, tested, and installed special new packing machines for these "King-Size" cartridges.

Our technical service and sales representatives will be glad to discuss with you how these "King-Size" cartridges can go to work for you.

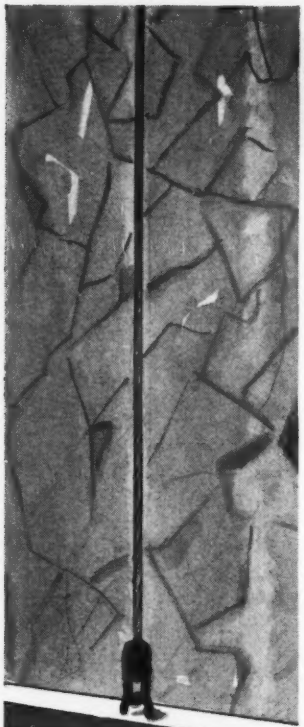


THREE TIMES AS LONG... Here is one of the new "King-Size" Hercules cartridges—24 inches in length, shown alongside the same grade in the conventional 8 inch size.

HERCULES

HERCULES POWDER COMPANY
INCORPORATED
Explosives Department, 922 King St., Wilmington, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N.Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.



LOOK HIGH...

LOOK LOW...

NATIONAL BRUSHES

TRADE-MARK

ARE YOUR BEST BUY ALL THROUGH MINE AND MILL

The "National" brush line is a *complete* line—offering grades, sizes and types specifically designed for the wide range of operating conditions found in rotary d-c equipment.

COMMUTATION A PROBLEM?

National Carbon research in this field is almost alone responsible for the many special-purpose, high-commutation brush grades, now standard in the industry.

COMMUTATOR FILM ACTING UP?

"National" brushes' special film-control properties are especially effective in eliminating film breakdown and threading under difficult extremes of current density and sudden load-swing.

CONCERNED OVER BRUSH LIFE?

With the entire "National" brush line to choose from, you are certain of getting maximum brush life consistent with overall satisfactory brush performance.

There are far more "National" brushes working in mine and mill than any other brand. Find out for yourself why "National" brushes are preferred for main drives and generators, heavy-duty general-purpose and mill-type motors.

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

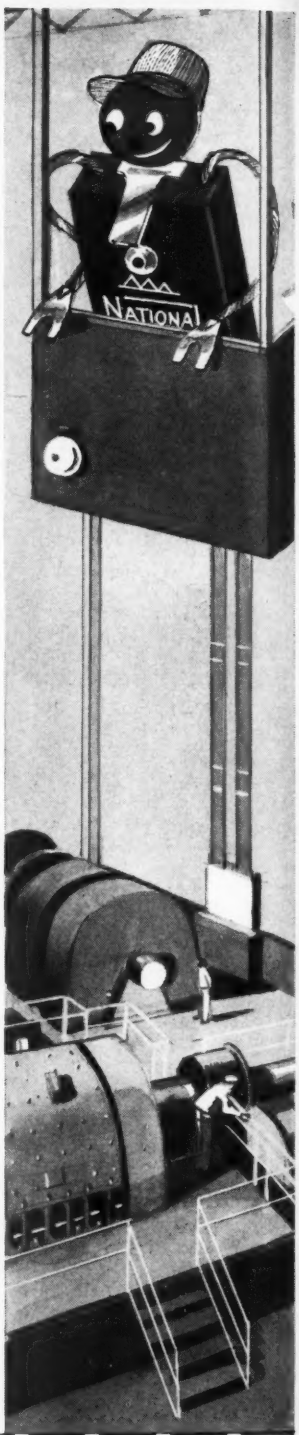
NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco

IN CANADA: Union Carbide Canada Limited, Toronto



YOURS FOR THE ASKING . . . National Carbon's instructive pamphlet series on the practical aspects of motor and generator maintenance. Supervisors should request as many copies as they need to distribute personally to their men. Coupon automatically brings back-issues and each new, bi-monthly issue for two years or more.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

No. of copies_____ *Signed*_____ Dept. MC-3-5

The Facts Behind Allis-Chalmers Leadership in Torque Converter Tractors

***Fourteen* years of experience . . . *eight* years with production models . . . *thousands* of torque converter tractors out in the field . . . *millions* of operating hours on every kind of work.**

TODAY'S tractor users have given their "stamp of approval" to torque converter drive—as a key factor in the new standards of performance they need for today's jobs. Here's why —

Automatic Matching of speed and pull to load and terrain conditions . . . more dirt moved every hour, day in and day out.

Hydraulically cushioned protection for engine, clutch, transmission, rear end. The entire tractor lasts longer! That means less downtime, lower maintenance costs.

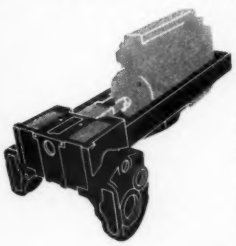
Operators love it! Allis-Chalmers torque converter tractors are so easy to handle (most shifting is eliminated) that operators do a top-notch job all day long.

Yes, the industry's most experienced men are demanding and buying torque converter tractors . . . *and in this, Allis-Chalmers leads the way.*

But, remember, you don't buy just one feature . . . you buy a *tractor*, with torque converter drive designed as a matched part of the entire machine. This advanced drive is only *one* of the many outstanding features that have switched so many users to Allis-Chalmers tractors. So . . .

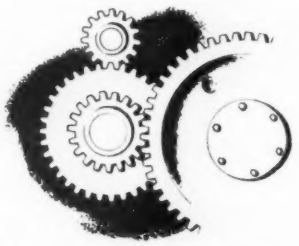
Check all these features before you buy!

All-Steel Box-A Main Frame with one-piece, rear-end housing gives improved weight distribution, soaks up shocks, provides better equipment mounting, greater servicing ease . . . longer equipment life.



Service Simplicity of Unit Construction — Power drive components can be easily removed, repaired or replaced without disturbing adjacent parts . . . saving time and money.

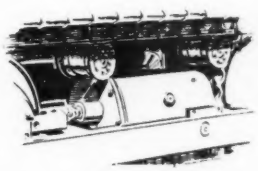
"Live" Sprocket Shafts — "Live" shafts with straddle-mounted bearings permit small, more serviceable seals. Double reduction final drives with smaller gears and shorter, heavier shafts mean extra ground clearance, better alignment, longer life.



1,000-Hour Lubrication — Tapered roller bearings and positive seals on truck wheels, idlers, support rollers and final drives extend lubrication intervals, cut downtime.

Hydraulic Booster Steering — Gives operator small tractor maneuverability with new ease. In addition, self-energizing brakes which take hold with a firm, uniform grip, provide exact control and sure safety with less pedal pressure.

True-Dimension Track provides maximum ground contact . . . plus the right design, the best steels for every job condition . . . heat-treated for long life with the industry's newest, most complete facilities.

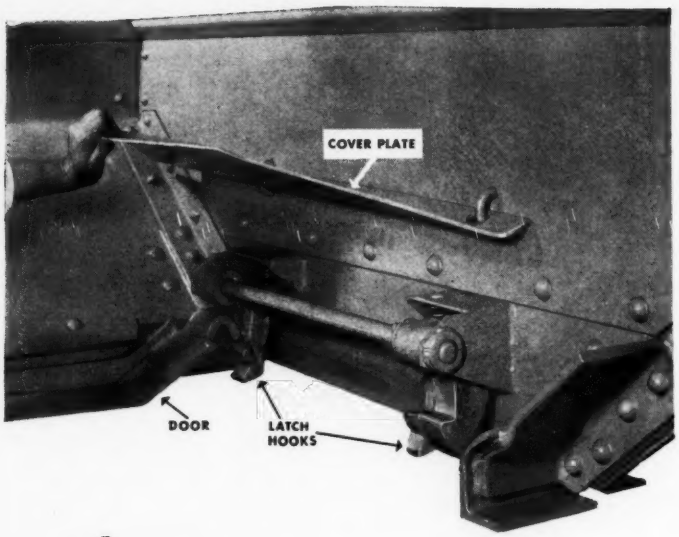


Oil-Enclosed Track Release Mechanism — Operates in oil, seals out dirt and moisture, always in working condition to provide positive protection.

See your nearby Allis-Chalmers dealer now for the full story. Whether you're interested in a big tractor like the HD-20 or HD-15 . . . or the smaller HD-9 and HD-5, you can be sure of getting the most advanced tractor in the business, because Allis-Chalmers is the leadership line.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



Only S-D Automatics give you these advantages

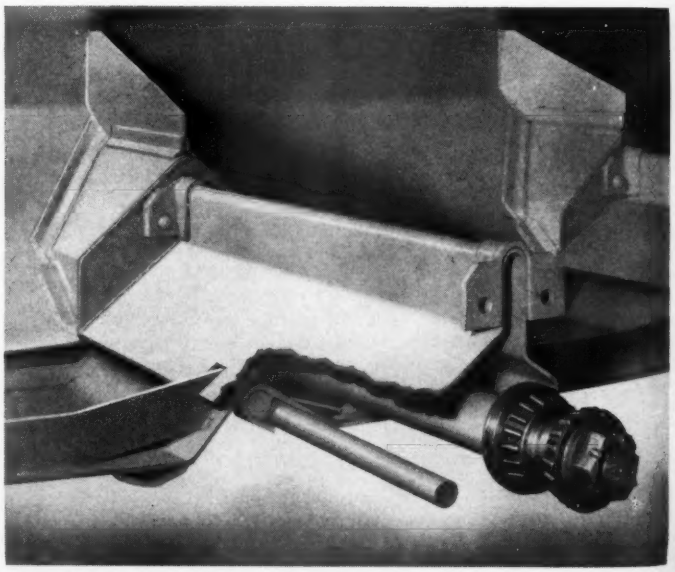
1 TWO LATCHES FOR SAFE AND SURE LATCHING! They are tripped simultaneously underneath car for automatic dumping. With S-D "Twin Safety Latches" your bottom dumping car doors are actually padlocked twice. These latches (see photo above) are tripped independently by a pair of tripping devices mounted between the rails. (Note the tripping devices shown in bin photo on opposite page.) Both latches must be tripped simultaneously before the doors open. This eliminates doors opening accidentally anywhere along the haulage route.

1 "Twin Safety Latches" for safe and sure latching

2 Safety Sealed against dust leakage

3 ¼ to ½ ton more capacity per car for the same overall dimensions

2 SEALED AGAINST DUST LEAKAGE! Sanford-Day's exclusive bottom dumping car seal means two extra values: (1) Sealed S-D Automatics give you a new, safer in-the-mine operation by eliminating leakage of dust. (2) Sealed S-D Automatics enable you to make a tremendous reduction in track clean-up costs. Cross-sectional view at right points out how the flares extend over doors when closed, sealing material in car.



3 ONE-QUARTER TO ½ TON MORE CAPACITY PER CAR FOR THE SAME OVERALL DIMENSIONS is available only in S-D Automatics because of the construction features of Sanford-Day's exclusive bottom dumping car design. If you were buying, for example, 16 bottom dumping cars of any other make with a 4-ton level full capacity, you would need only 14 S-D Automatics of the same overall dimensions to haul the same tonnage. You would save two cars in every 16 . . . 12½ percent in original investment . . . 12½ percent in maintenance . . . 12½ percent less dead weight to haul. Any one of our sales engineers will demonstrate to your complete satisfaction just how we are able to give you this extra capacity.

THESE THREE fundamental and necessary advantages are offered only by S-D Automatics! They mean that only S-D Automatics can haul coal out of your mine at the lowest possible cost! Assure yourself of the maximum economies bottom dumping cars offer you by buying S-D Automatics! For complete information, write or call us today. Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tenn.

Sanford-Day IRON WORKS

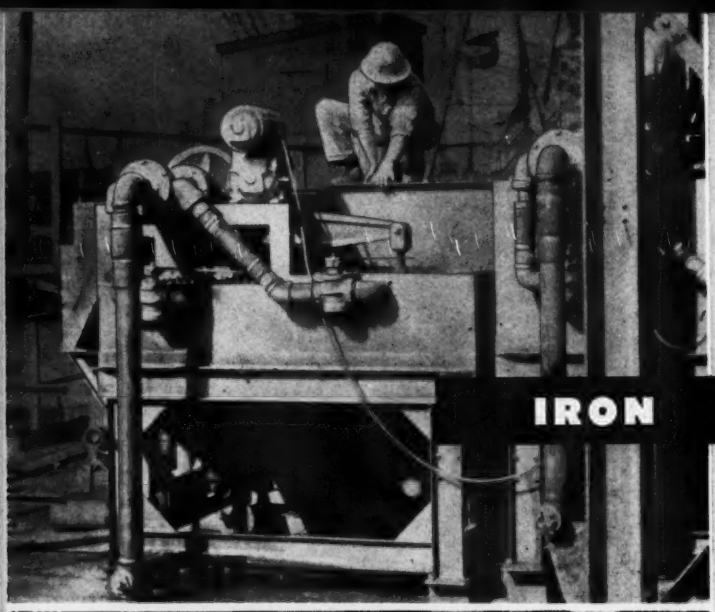
KNOXVILLE • TENNESSEE

AND BROWN-FAYRO DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
PUMPS - OIL SPRAY SYSTEMS

DENVER JIGS

How They Serve Big Mills Everywhere



IRON

IRON—Two 24" x 36" Duplex Denver Jigs on hematite beneficiate upwards of 15 tons per hour of —¼" +48 mesh feed; increase grade from 49% to 55%. Operators like Denver Jig's high capacity and end-draw-off method of removing concentrate. Rotating water valve and Denver Dowsett Valve conserve water. Mechanism, easily accessible, is away from splash and drip. Jigs are simple to operate and easy to adjust.

MANGANESE

MANGANESE—Two 24" x 36" Duplex Denver Jigs in open circuit handle —⅜" +10 mesh Pyrolusite ore. Tonnage of 9 t.p.h. runs 15% Mn. Concentrate runs 42% Mn with tails of 5%. Jig concentrate is blended with heavy media sink. Denver Jigs extended recovery to sizes below range of heavy media plant.

LEAD—Two 36" x 48" Duplex Denver Jigs handle 45 tons per hour of primary rod mill discharge. Jig concentrate runs +80% pb. This company has several Denver Jigs operating at various mills. Denver Jig is also valuable in recovering minerals as soon as freed in grinding to avoid loss due to overgrinding and sliming.

TUNGSTEN—Denver Jigs solve problem of slime losses by recovering scheelite and wolframite from coarse through fine sizes as soon as free. Jigs produce high grade, clean concentrates from unclassified feed.

DENVER DOWSETT DENSITY CONTROL VALVE automatically discharges when solids in hutch exceed valve setting. —Automatically shuts off when solids are removed. Saves time, saves water. Has many applications. Improves jig performance.

Jig tests will tell you what Denver Jig can do for you. Please write today.

"The firm that makes its friends happier, healthier and wealthier"

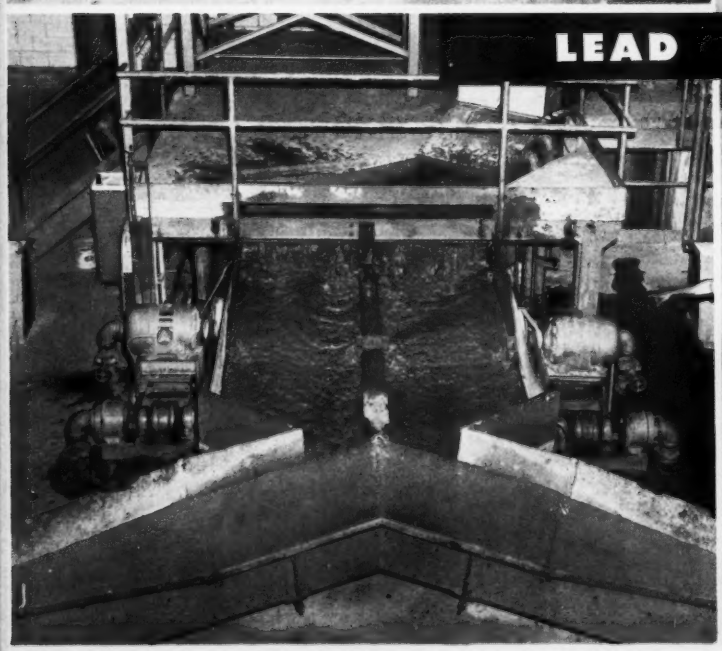
DECO FLOTATION ENGINEERS

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT COMPANY

1400 - 17th St., Denver, Colo.

Denver, New York, Chicago, El Paso, Salt Lake City
Toronto, Vancouver, Mexico, D.F., London, Johannesburg

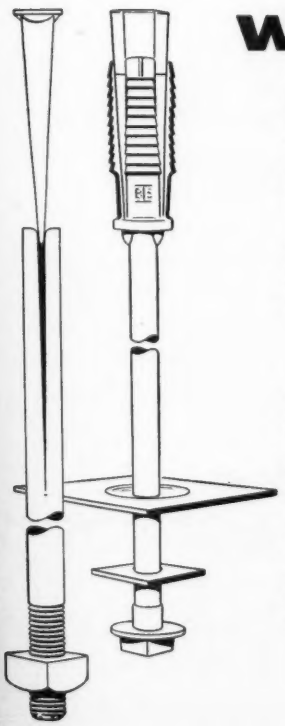


LEAD

TUNGSTEN

Up Goes Production...

When Roof Bolts Go In



When you equip your mine with roof bolts, production is increased because of the wider openings and clearances, and increased room in which to operate mechanized equipment. And with large, old-fashioned supports out of the way, ventilation is improved.

Roof bolts make larger work area possible, and permit a tight, sound roof, because they consolidate strata into a single-unit thick beam. With such roof control, the possibility of serious roof falls is minimized.

4 Types of Bethlehem Roof Bolts

Bethlehem produces four types of roof bolts, to enable operators to increase production, and promote safety.

SLOTTED BOLT. This husky 1 in. bolt has a centered slot which is made by forging, without any loss of metal. Other end of bolt has 5 in. of rolled threads. Bolt is used with steel wedge, which is forced deep into slot, expanding the bolt-ends, when bolt is driven in 1¼ in. hole. Bolt has truncated-cone point to prevent thread damage. Normally furnished with American Standard regular square nut, which is tightened against roof plate.

SQUARE-HEAD BOLTS. Three types: a ¾ in. carbon-type, and a ⅞ in. high-strength bolt, each with breaking load of 20,000 lb; also a ⅞ in. high-strength bolt with minimum breaking load of 40,000 lb. The ¾ in. and ⅞ in. bolts can be used with Bethlehem's matching-halves Type F expansion shell or the 4-leaf Type C expansion shell. The ⅞ in. bolt is for use with the Type F shell in 1½ in. hole.

HARDENED WASHERS. Bethlehem's hardened washer for use with headed bolts reduces the friction between bolt head and roof plate that occurs when high tension in the bolt produces excessive bearing pressure. With this washer, impact wrenches can be used freely, without galling or tearing of metal.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Operator ties MS Connector into "Primacord" trunk line. These dependable Connectors enable crews to tailor the delay-firing pattern to any set of conditions.

For safer open-pit blasting . . .
KEEP CAPS OFF THE JOB UNTIL FIRING TIME
BY USING DU PONT MS CONNECTORS!

Taconite blasting operations in Minnesota move along with greater safety, thanks to Du Pont MS Connectors. Caps come on the job when, *and only when*, the blast is ready to fire . . . a safety feature crews appreciate. Flexible, too. Whether they're shooting single or multiple rows, these crews can get any practical delay pattern simply by (1) cutting the "Primacord" lines at the proper spots, and (2) tying or taping MS Connectors in place. The number of delay periods is literally unlimited. As a result, vibration's reduced to the very minimum.

Last but not least, MS Connectors provide the improved breakage and reduced backbreak typical of all short-interval firing. Mines using them report "best breakage ever," even in tough taconite.

So see if MS Connectors can improve breakage and increase safety in your mine by trying them soon. For complete information contact the Du Pont man in your district or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Del.

DU PONT
BLASTING AGENTS
Products of Du Pont Research

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Editorials

JOHN C. FOX, *Editor*

MARCH, 1955

National Fuels Policy

LAST summer, at the direction of the President, a Cabinet Committee on Energy Supplies and Resources Policy undertook to study and evaluate all factors pertaining to the continued development of energy supplies and fuels resources in the United States. The Committee's report* was made public by the White House on February 26.

In its report the Committee gratefully acknowledges the aid given it by a representative task force composed of able coal mining leaders. It recognizes that coal's economic position is seriously depressed and in its recommendations proposes certain steps to improve the situation.

For example, the Committee firmly recommends that in the absence of voluntary action by the railroads, the Interstate Commerce Commission should adjust coal freight rates by compulsory order to the extent necessary to reduce the disproportionate share of railroad operating costs now borne by the coal mining industry. Such action would place coal in a better position to compete with other fuels.

The report also recognizes that excessive imports of foreign oil could impair the domestic fuels situation so as to "endanger the orderly industrial growth which assures the military and civilian supplies and reserves that are necessary to the national defense."

However, the Committee naively recommends that importers of foreign crude oil and residual fuel oil voluntarily limit the amounts they bring into this country—hoping thus to prevent imports from significantly exceeding the proportions they bore to domestic production in 1954 (when imports had already reached an excessive figure). The report goes on to say, "The Committee believes that every effort should be made and will be made to avoid the necessity of Governmental intervention."

To those vitally concerned it seems that every effort *has* been made to secure voluntary limitation of imports of foreign crudes and residual oils, without avail. Nor do they see any reason to believe future efforts will fare any better. Legislation establishing realistic import quotas on the flood of foreign oil is urgently needed *now*.

Recognizing the serious unemployment and business distress in the coal industry, the committee recommends "that the Interdepartmental Committee on the Soft Coal Industry be continued for the purpose of developing for Cabinet consideration specific action programs to alleviate these conditions." This same Committee has been studying the problem since last July. Meanwhile, possibly 100,000 coal miners were dropped from company payrolls during 1954. They, their families and the hundreds of small businesses that depend on their trade are struggling to survive. Time is of the essence.

Nowhere in the report is reference made to atomic power, though it would appear that a full consideration of the energy needs and resources of the nation should take into account the potentialities of nuclear energy sources.

Taken in its entirety, there is much to commend in the Committee's report. Its chief fault is that it is only a beginning and leaves the solution of too many of the industry's problems to the indefinite future, when immediate action on firm policies is demanded.

A Laudable Practice

ON numerous occasions, on this page and elsewhere, the problem of attracting more top flight young people to the minerals engineering field has been stressed. One method to achieve this is to finance students through scholarships.

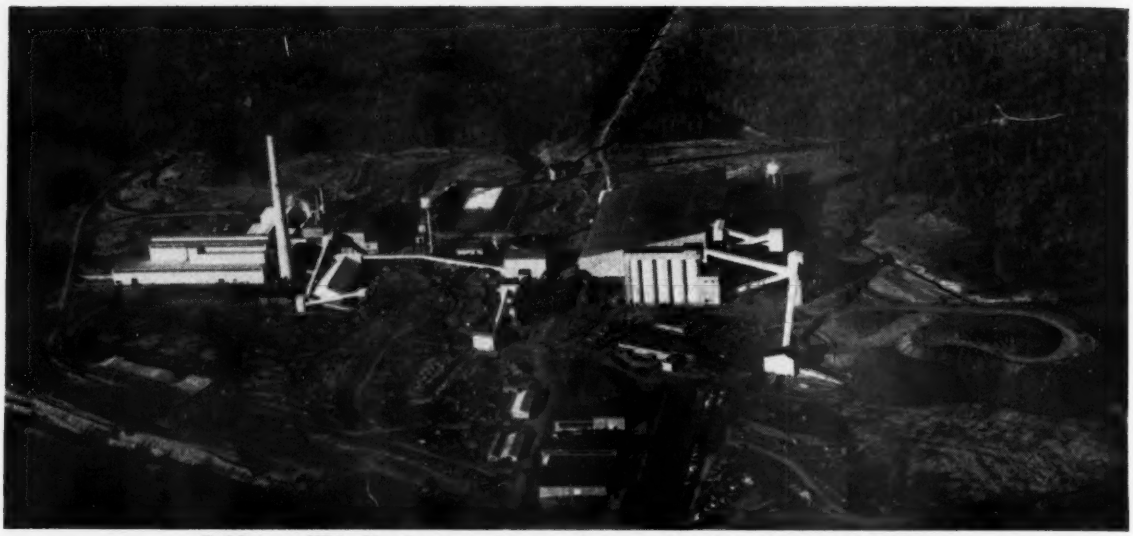
A recent press release focused attention on another aspect of the problem—the high cost of education to the school. In recognition of the fact that tuition fees cover only a part of this cost Kennecott Copper Corp., for each scholarship or fellowship awarded during 1954, has granted an equal amount to the school where the student enrolled.

Such practice should be more widespread. It is an effective answer to the Government-financed school which may, it is true, turn out more graduates. Russia, for example, is currently graduating some 54,000 engineers to our 20,000 but mass education results in a uniform product and does not produce leaders.

If we want our schools to turn out the better trained, more competent leaders we need, we should not only award scholarships to deserving students but should see that our institutions of higher learning have the funds to provide them with the best education possible.

---

* See page 66 for a full report on the 12 recommendations of the Committee.



Buildings at White Pine house crushers, grinders, concentrating equipment and smelter

Mining and Milling at White Pine

Careful Coordination and Control of Planning and Construction Led to Reopening of White Pine Mine With Minimum Expenditure of Time and Money

By HAROLD B. EWOLDT

Vice-President
White Pine Copper Co.

WHITE PINE Copper Co. is a wholly-owned subsidiary of the Copper Range Co., of Boston Mass., and its mining properties are located in Carp Lake Township, Ontonagon County, Mich., some 20 miles southwest of Ontonagon, the county seat. The plant is five miles south of Lake Superior from Silver City, a small town at the mouth of Iron River. Rail service is available through a 14-mile spur connecting with the main line of the Duluth, South Shore and Atlantic Railroad at Bergland, Mich. The White Pine Post Office was established in February 1954.

Ten miles west of the plantsite the Porcupine Mountains rise to an elevation of 2000 ft, the highest point in Michigan, and the Bergland hills, rising 1700 ft above sea level, are some five miles south. These elevations form the walls of a basin about 10 miles square whose floor slopes gently toward Lake Superior and is drained by two major streams—the Iron River and the Mineral River. These streams —along with numerous smaller creeks —drain to the lake five miles north of the plantsite and have eroded rather deeply into the heavy clay soil. The average elevation at the project is 863 ft. Lake Superior is 603 ft above sea level. The plantsite and townsite areas except where broken by the smaller streams are comparatively flat and covered with a heavy second growth of aspen, hemlock, and tamarack. The area, formerly heavily timbered with white pine which gave the project its name, was logged about the turn of the century.

The climate is typical of the north country but due to the proximity of the lake and the sheltering hills does not have the extremes of temperature common to the prairie states farther west. Snowfall average 90 to 100 in. per year, mostly falling from December through April. The spring is wet with 10 to 15 in. of rain from May to August. August through November is the favored season of the year for construction activities.

Ore is loaded mechanically into 18-ton diesel-mechanical trucks

Ore Assays 21.3 Lb Per Ton

White Pine ore body lies in the bottom beds of the Nonesuch formation, a 500-ft series of gray siltstones, sandstones, and shales. The Nonesuch is sandwiched between thousands of feet of brown sandstones—Copper Harbor sandstone below and Freda sandstone above.

The orebody consists basically of four distinct sedimentary beds—lower sandstone, parting shale, upper sandstone, and upper shale—of which only the two shales are extensively copper-bearing. The total ore reserves at present amount to 309,000,000 tons, averaging 21.3 lbs of copper per ton. In the parting shale, alone, are 154,000,000 tons of higher grade ore averaging 24.3 lbs per ton. Initially, only the parting shale seven to eight ft thick will be mined. The total mineralized section ranges from 10 to 20 ft thick, with 90 percent of the copper occurring as the mineral chalcocite in grains so small as to be practically invisible. The balance of the copper occurs as covellite, bornite, and flaky native copper.

Two Theories of Origin

Horizontally, the limits of the ore body have not been determined. It has been outlined by drilling over an area roughly three by five miles. In general, the ore beds lie in a gentle fold, the axis of which dips about six percent and gives the ore body the shape of a large, low hill with gentle slopes on either side.

There are two schools of thought on the genesis of the ore body. One advocates a syngenetic and the other an epigenetic origin. One theory advanced by the syngenetic school is that originally the parting and upper shales were muds and silts deposited in a shallow lake or swamp. Copper derived from the lava flows which now form the backbone of the Keweenaw Peninsula were carried into this sulphurous area and precipitated; the sediments later consolidated into rock and were deformed to their present state.

A 3000-Year History

Presence of native copper in the Upper Peninsula of Michigan has been known since time immemorial. A recent expedition, sponsored by the Michigan Institute of Technology, uncovered evidence of copper mining over 3000 years ago and archeologists state that copper artifacts discovered in western Europe, the mounds along the Ohio River, and in the Aztec ruins of Mexico were made of native copper from the Lake Superior region. While some prospecting was done by the early French and British traders prior to the Revolutionary War, the actual production of copper from the Upper Peninsula began about 1844 near Ontonagon and gradually spread northward to the Keweenaw Point. Information supplied by the U. S. Bureau of Mines shows that from 1845 to 1952, the Upper Peninsula produced 9,926,515,092 lb of copper. The district reached its peak production during World War I and then declined gradually. The mining economy and philosophy of the area were based upon the extraction of native copper from the ores and little attention was paid to other types of copper mineralizations.

Just prior to and during the First World War 18,233,169 lb of copper were produced at White Pine from a native copper deposit. After the War, the property lay dormant and was purchased by Copper Range Co. in 1929. In 1937, a diamond-drilling program was initiated and continued until 1950. During this period, a test shaft known as the Schacht Shaft, in honor of a former president of the company, was sunk in the orebody. Some 8000 ft of development drift was driven and 100,000 tons of ore mined for beneficiation tests. The engineering data obtained during this exploration period gave factual information used in designing the plant and planning the mining system. To supplement these data, company engineers and consultants visited several operating properties for information on specific problems.

Ball mills operate in closed circuit with 84-in. spiral classifiers

Coordinate Activities

With the outbreak of hostilities in Korea in 1950, the country found itself short of copper and the Government requested Copper Range Co. to make a study for the development of its White Pine ore body to produce some 75,000,000 lb of copper annually.

The real problem was to coordinate and control the planning and construction of the project so that it could be accomplished with a maximum economy of both time and money, and the Copper Range Co. gave this assignment to the Turner Construction Co., New York.

Scope of the work to be done by each engineering firm had to be carefully defined to avoid overlaps or gaps. Stone and Webster Engineering Corp., Boston, were to plan and design the power requirements. Western-Knapp Engineering Co., San Francisco, was assigned the planning of mining, milling and smelting. Pace Associates, Chicago, assumed responsibility for the planning of the townsite appurtenance works and nonprocess building. Moran, Proctor, Mueser and Rutledge, New York, advised on foundation problems. Technological consultants include the late Dr. L. E. Young, mining; Lee Tucker, ore-dressing; and A. D. Wilkinson,

An eight-in. auger drilling the 11 to 14-ft burn-cut hole increased speed of advance in drift

smelting. The work in the field had to proceed as plans were made. It was, therefore, essential that the work of each group of engineers be scheduled in accordance with a master progress plan to assure availability of information as needed in the field and for the purpose of procurement of critical materials, equipment and subcontracts on a competitive basis.

The adequacy of design of the various parts of the work, including equipment, was the responsibility of the engineers having jurisdiction. The designs are passed upon by the owners' representatives and those of the Reconstruction Finance Corp.

Many Problems Solved

Numerous problems presented themselves in selecting the location for essential processing equipment of any minesite. Area topography, location of the mine portal and soil characteristics place certain limitations on foundation designs.

Due to the dome-shaped, bedded-ore deposit with its two main zones of deposition each posing somewhat different mining problems, an underground mining and ore transportation system was called for to fit both situations. The results was a method utilizing diesel, shuttle-car haulage, under ground crushing, and belt conveyors.

Shape of the ore body dictated location of the mine entrance, a concrete arched tunnel on a minus 10 percent grade, to encounter the orebody under 70 ft of clay overburden at the western terminus of the dome. The portal is 32 ft wide and 19 ft high, sufficiently large to allow two-way traffic and space for ample ventilation. Within the ore zone, a triple-entry system extends 5000 feet to the 15-ft diam ventilation shaft. Provision is made for about 550,000 cfm of air, if required. All men and materials enter the mine through the portal. The crushing station is 3600 ft from the entrance and has 5000 tons storage capacity. The 54-in. conveyor belt, located in a tunnel beneath the ore, is fed from the storage pocket and carries the ore to the surface in two lifts on a 16 percent grade. Stoping is by modified room-and-pillar system. Ore is mechanically loaded into diesel shuttle-cars which carry it to the crushing station. There it is reduced to minus eight-in. and carried to the surface ore bins by belt. This method is adapted to mining and extensive ore deposit which extends over many square miles. It allows for expansion of the daily tonnages and also for reaching the outer extremities of the ore, when this becomes necessary.

Mining Plan Flexible

The main service drifts — M-1, M-2 and M-3 — are variable in height but not in width. The principal drift is 12 by 24 ft in section, and the others are 8 by 24 ft. Drifts are separated by 30-ft pillars. Drift M-1 was driven larger to allow transportation of the electrical substations and crusher equipment underground.

Outside Drifts M-1 and M-2, 175 ft wide barrier pillars are maintained to protect against subsidence or ground movement in the main entry. The cross-entry system is five drifts wide, to allow development to proceed concurrently with stoping and to allow extension at some later date for belt transportation system in the plane of the ore body.

Production operations within the areas adjacent to the main drifts are based on 32-ft wide working faces. Extraction from these panels is 62.5 percent, thus adding to pillar support for the main entries. As stoping progresses outward, the extraction is increased to 85 percent.

Work within the panel rooms is planned so that a minimum of three and a maximum of seven working faces will be available at a given time.

Flotation section comprises rougher, scavenger and cleaner cells. Cyclones separate slime tailings from primary rougher circuit.

Panel pillars are laid out so that the extraction rate from a given panel can be increased without revision of the operating schedule. Primary pillars are 20 by 148 ft, secondary pillars are reduced to 20 by 28 ft by cutting the primary pillars twice and in the outer areas pillars will be reduced to 12 by 20 ft.

The stoping cycle has been fashioned around the loading machine, and the equipment necessary to keep the loader working at capacity is designated a "unit." This unit contains a Joy 18HR2 loader, two jumbos—each mounting two 3½-in. drifters; three 18-ton diesel shuttle cars; two semi-portable 830-cfm air compressors and a bulldozer or front-end loader.

A typical working face, eight ft high by 32 ft wide, requires 26 to 28 holes drilled 10 ft deep. Amodyn explosives are used in blasting.

Roof support is a minor problem and, where required, four and five-ft bolts ¾-in. diam are installed.

In the development cycle, the Ka-Mo drill using an eight-in. bit and drilling the burn hole has materially increased advance.

Some experimental work is being done with a pneumatic rotary type drill, which gives much promise of being adaptable to the operation.

Primary Crusher in Mine

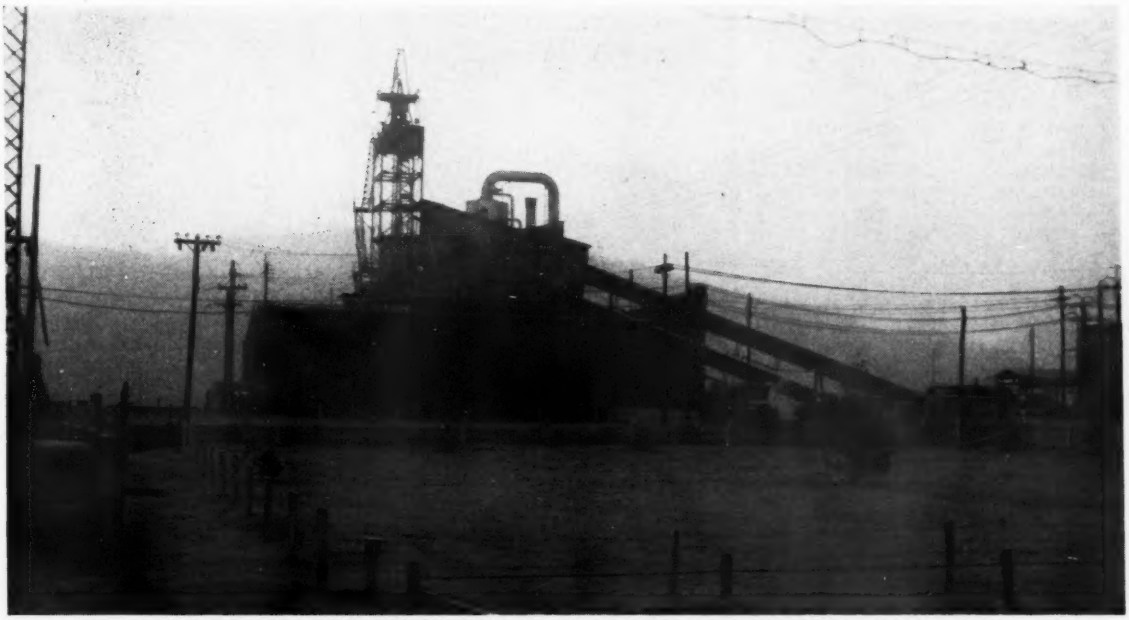
In the milling process, secondary and tertiary stages of crushing reduce the minus eight-in. ore received from underground to ⅜-in. The primary grinding units are 12½ by 13-ft grate ball mills, each driven by a 1500-hp synchronous motor, and each operating in closed circuit with two 84-in. spiral classifiers. The flotation section comprises rougher, scavenger, and cleaner cells, with cyclones being used to discard a deleterious slime trailings fraction from the primary rougher circuit. The regrind section consists of three 8 by 22 ft tube mills, each driven by a 500-hp motor. The concentrator is a windowless, steel and concrete structure 294 ft wide and 458 ft long. The five coarse ore bins are 34 ft in diam, 106 ft high, and have a live storage of 2000 tons each. The six fine ore bins are 52 ft in diam, 70 ft high, and each has 3100-ton live storage capacity.

Concentrate is mixed with flux, conveyed to the smelter feed building, and thence to the reverberatory furnace. Conventional smelting processes produce fire-refined lake copper.

Conclusion

Special credit is due Morris F. La Croix, president, and Philip F. Beaudin, executive vice-president, for their untiring work in preparing the White Pine ore body for operation. Closely allied with the project has been R. C. Wilson, chairman of the board, Turner Construction.

Mining at Powhatan No. 1



Half of the mine's 5400 tpd production is loaded into railroad cars and half into river barges

Use Off Track Mining, Roof Bolts, 13-Ton Cars and High Speed Haulage to Produce 20.7 Tons Per Man at the Face

By GEORGE W. SALL

THE No. 1 mine of the Powhatan Mining Co. is located at Powhatan Point, Ohio; the tipple is on the Ohio River, about 18 miles south of Wheeling, W. Va. Opened in 1923, the mine works the Pittsburgh No. 8 seam which is between 60 and 68 in. thick here. For the most part full seam mining is practiced, although no secondary mining is done. Area recovery averages about 65 percent.

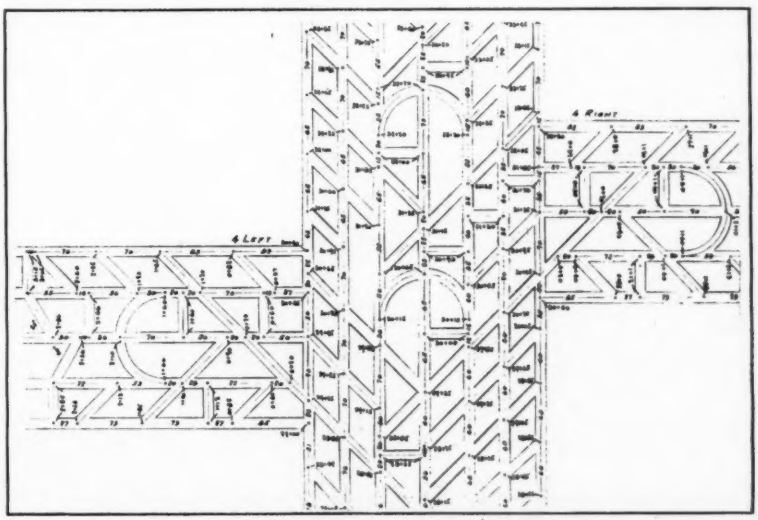
At the present time there are 11 mechanical loading units working two shifts each and five units on the third shift. The tipple operates only two shifts, coal mined on the third shift being stockpiled in mine cars. Mining is off-track and the transition from timber to bolts for roof support is just about complete. Production per face man averages 20.7 tons with total production being 5400 tpd.

Coal is lifted to the surface through a 100-ft shaft by balanced skip hoisting. The original 600-hp G. E. hoist motor is still in operation. Skip capacity is six tons and the hoisting cycle is so arranged that each skip makes approximately two round trips a minute.

At present a map of the main haulage entry and the two sets of working face entries takes the shape of an elongated capital letter T, with the stem being the five-mile main haulage entry which runs almost due west from the Ohio River.

Mining Plan

Mining is by conventional room and pillar method. Face entries are turned right and left on 3000-ft centers off the main line, which is approximately in the center of the property. Butt entries are turned off the face entries on 695-ft centers and driven 1500 to 1700 ft deep. Seven places are driven



Development plan for face and butt entries

on face entries and five on the butts. In each case the three center entries are driven on 50-ft centers and the outside entries on 40-ft centers. Rooms, in sets of seven at one time, are turned right and left off the butt entries and mined retreating.

The area of solid coal blocked out between the butt entries is 515 ft thick. It is mined by driving rooms 245 ft deep into it from both sides, leaving a 25-ft pillar between each panel of rooms to protect the room. In addition, a 25-ft pillar is left between each set of seven rooms.

Extraction is limited to 65 percent in this part of the Pittsburgh seam because of a massive limestone formation which has to be held. It runs about 60 ft thick and is about 12 ft above the coal seam. Experience has proven that the limestone does not break readily and when it starts to subside causes a general squeeze condition over a wide area.

Rooms are necked narrow, 12 ft, for two or three cuts on 30-ft centers as the butts are advanced. As soon as room work begins, they are widened to 20 ft. The top two rooms off each butt entry are holed through to provide bleeders for ventilating mined-out areas.

Angle rooms have been experimented with at Powhatan No. 1, but it is now the feeling that 90° rooms will be better in the long run.

Thirteen-ton capacity mine cars are loaded by elevating conveyors. A loop track system is used at all loading heads

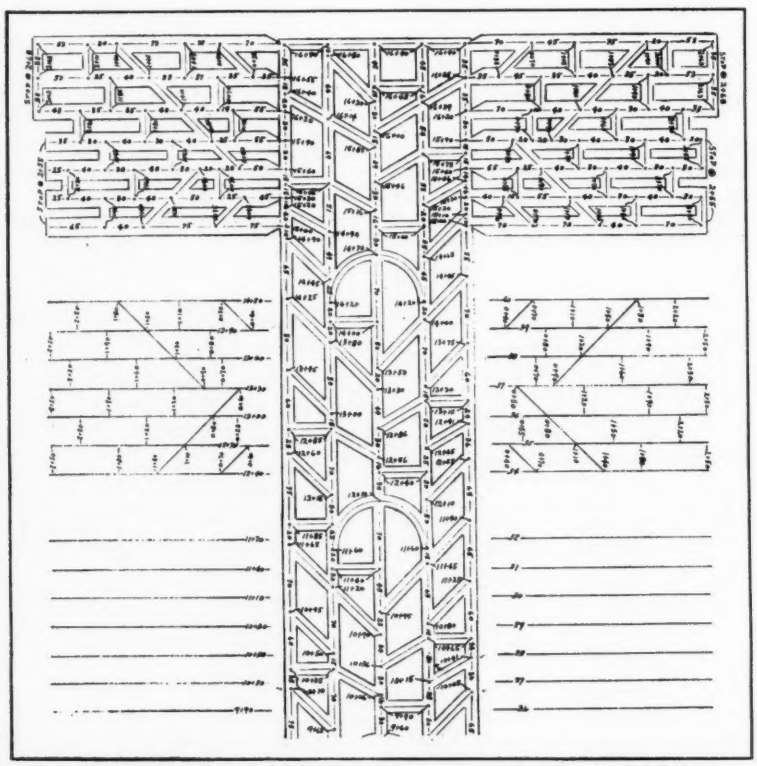
At the Face

Coal is middle cut with 10 RU cutting machines. The presence of pyrite boulders in the bottom precludes bottom cutting. Coal is also sheared—a side shear in narrow work and center shear in rooms. Post mounted Jeffrey A-6 drills are used to drill both coal and slate; three holes in the slate and two in the coal. Four sticks of duPont Lump Coal C permissible dynamite are charged in each hole which is then tamped with rock dust. Holes in the coal are below the cut. Coal above the cut is shot down with the slate. Whenever the drawslate gets thicker than 12 in. it is loaded out separately. When this is the case, three extra holes are drilled in the coal above the cut. The slate is not shot until the coal has been loaded out.

Joy 14 BU machines load into shuttle cars. Two shuttle cars are used on each section with both 5 and 7 SC's being employed. Shuttle cars are equipped so that one car in a section lays its cable to the right and the other to the left. In this manner there is a minimum of cable shifting and the chances of running over cable are reduced.

Loading heads are placed on the center entry on each set of butts and are advanced every 250 ft. Track is laid in the second and fourth entry on the five-entry butts with a 50-ft radius curve run-around put in at every loading head. That is why the center three places on face and butt entries are driven on 50-ft centers—to allow for the 50-ft curve. Theoretically this could be a 42-ft radius curve (limited by the large car size) however, the 50-ft radius has proven more practical. All such curves are driven on sights.

Elevating conveyors are used at each loading head. To get clearance over the cars, top has to be taken down at these points; generally by slabbing the top with the cutting machine as the entries are driven. Sometimes, however, the top is shot.



Rooms are turned right and left off the butt entries with a barrier left between each set of seven rooms

If the trip of cars on the loading head is pulled upgrade, a drag arrangement is used to prevent it from running away in the event a hoist cable should break or in some manner become disconnected. This is simply a piece of jack pipe which is hinged at one end of a clevis block. The block is pinned to the outside of the last car in the trip and the loose end allowed to drag along the ties. In operation, if the trip should break loose, the drag would bite into the track bed and derail the end car. If the trip is being pulled downhill, as many as five skids are used under car wheels to hold the trip back. The hoist pulls against the blocked trip to move it forward.

Roof Bolting

As mentioned before, most of the mine is now on roof bolting. Both Baker Fletcher and Chicago Pneumatic roof drills are used. Kennametal bits are used on all drills—both face and roof. In rooms and entries other than haulage ways, bolts are staggered one ft to the right and left of the center line on six-ft centers. At places where chutes are to hole through, four bolts are installed along the rib on three-ft centers. Three more bolts are put in on three-ft centers in the chute after it has been holed through. In haulage entries, three bolts are evenly spaced across the entry on four-ft centers. Five and six-ft bolts are used depending on the distance to anchorage.

Since the top is left standing, roof bolt recovery is practiced at Powhatan No. 1. At the present time about 75 percent of the bolts are recovered. They are sent to a small, underground shop to be reconditioned before re-use.

Roof bolting has meant a production increase of four tons per man at the face

All holes at the face are drilled with two-in. bits while roof holes are drilled with 1⅝-in. bits. When bits used to drill shot holes have worn to less than a two-in. gauge they are given to the roof bolter and used to start roof holes, which are driven in two stages. The second stage is then drilled with a 1⅝-in. bit to give proper anchorage to the bolt.

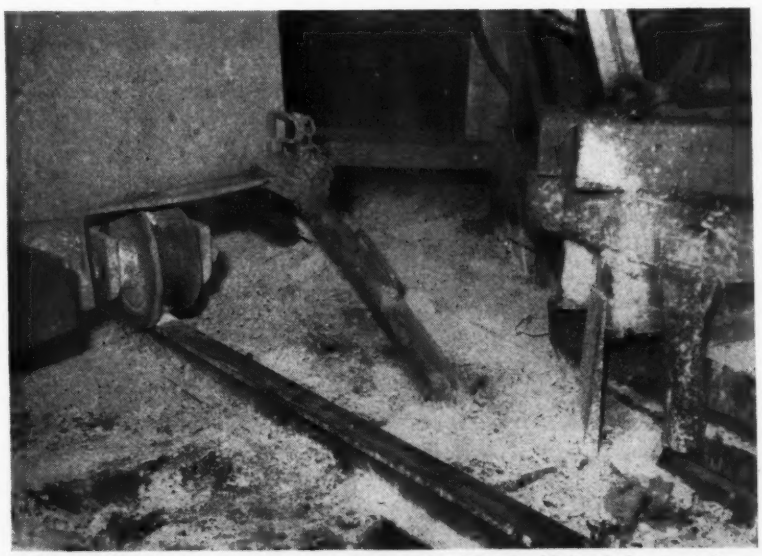
Cutting machine bits are tipped with a hard weld to prolong their life.

Crew Size

Standard ten-man crews, exclusive of the section foreman, are used on all roof bolting sections. On timbering sections an 11-man crew is used, the roof bolter being replaced by two timbermen. In addition to the men at the face, every crew has a loading-head man assigned to it. At times, when two crews are working rooms on each side of a butt entry, both units use the same loading-head man, reducing the size of each crew by ½ man. A typical crew is made up of the following:

1 loading machine operator
1 loading machine helper
1 cutting machine man
1 cutting machine helper
2 shuttle car men
1 driller
1 roof bolter
1 shot firer
1 loading-head man
10 Total

For the 11 units operating on the day and afternoon shifts there are six section foremen for each shift.



This homemade drag prevents a runaway if a trip should break loose at the loading head

Haulage

Coal is hauled to the shaft bottom in 13-ton capacity, 8-wheel Differential steel mine cars. Two new 25-ton Differential motors are used for main-line haulage. They handle from 22 to 26-car trips, generally on a four-mile haul between the main inside parting and the shaft bottom. At times, depending upon where the gathering locomotives are, the main line motor will go as far as one of the butt entries to drop a trip of empties. Then again, if loads start building up, a gathering motor will go part way outside to meet the main line motor and change trips nearer to the shaft bottom than the main parting. Three 13-ton and three 10-ton motors are used on gathering—one of each working together. The gathering motors attach empties to the tail end of the trip on the loading head and take away loads from the front end. In this manner there is always an empty at the loading head. Cars are pulled past the loading point with a cable drum hoist.

One pressure fan ventilates the mine, furnishing 155,000 cfm of air at a pressure of 5-in. water gauge

When a main line motorman reaches the shaft bottom, he drops his trip of loads and picks up a trip of empties, leaving the loads to be run through the rotary dump and set off to await the next main line motor. In addition, cars are turned around on the bottom to keep the couplers headed right. This has to be done because, with the system of loop loading at the face, the cars are turned around there also.

All locomotives are equipped with radio telephones as is the dumper at the slope bottom. In addition there is a telephone on each section. Both communication systems are tied in with the transportation foreman who has his office close to the main parting underground.

Main line track is laid with 60-lb rail for most of its length although 85-lb rail has been used to replace some of it. Track gauge is 42 in. and 5 by 7-in. wood ties are standard on main line. On the sections, 40-lb rail is used and steel ties replace the wooden ones on straight track. Track grade is almost ideal, being one percent in favor of the loads on the main line.

Ventilation

To save travel time a man portal was put down close to the active working faces. It is approximately four miles from the main shaft. Access to the mine is through a slope. The air shaft and a power substation are also located here.

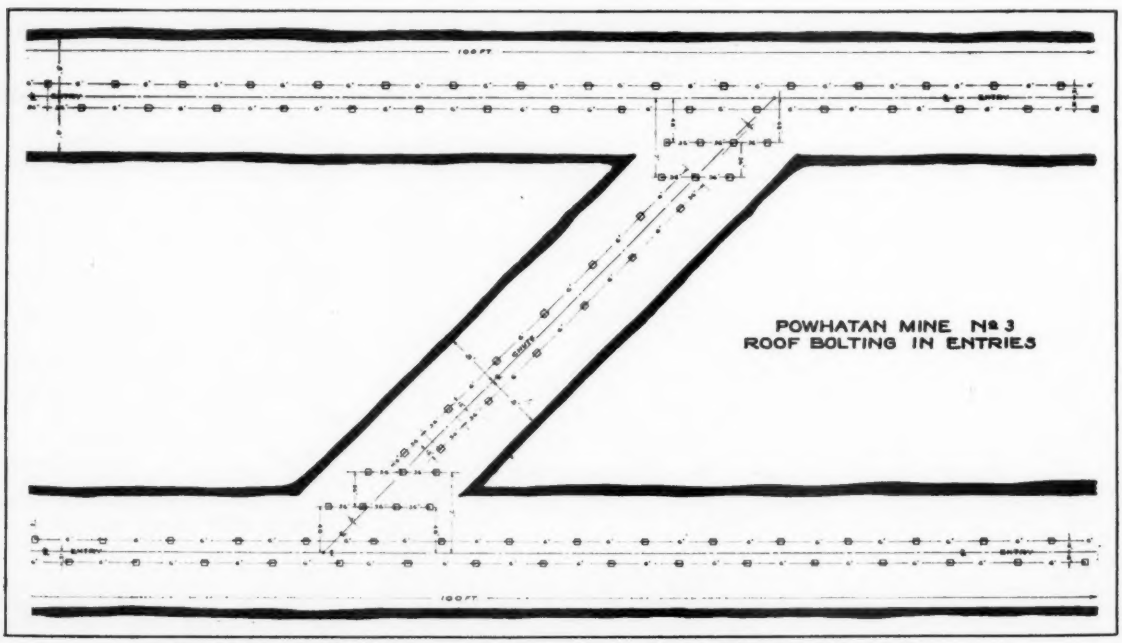
The mine is ventilated by one pressure fan adjacent to the new man portal which delivers 155,000 cfm at a five-in. water gauge. The main line haulageway is used as an intake from this point to the faces. A Canton Automatic mine door prevents the air from short circuiting back through the main haulage way to the shaft bottom although about 25,000 cfm is directed through the door to ventilate the main line to the outside.

At the present time a small crew on the midnight shift is driving a set of air entries parallel to the main haulage way. When completed, these entries will carry all the fresh air into the mine and the entire main haulage road will be on one fresh air split. These air entries will also serve as "air conditioners", smoothing out any great fluctuations in the temperature of the outside air before it strikes any travel way.

At the working faces there is a separate split of air for each set of faces. Since a bleeder system of ventilation is used, there is always positive ventilation of worked-out areas. There are now six return air shafts being used beside the hoisting shaft.

Power and Drainage

Power is taken by overhead lines on the surface to bore holes and piped underground. Here it is converted to 250-v d-c for mine use. There are three rotary converters inside the mine—two having a 300-kw capacity



Roof bolts are installed on a staggered pattern one ft right and left at the entry center line

and one with 550-kw capacity. On the surface there is one 300-kw rotary converter and one 50-kw mercury arc rectifier. The mine is operating on reversed polarity.

The mine is relatively free from water. The seam is entirely free of it and the only drainage problem is encountered close to the outcrop or at the bottom of shafts where surface water collects. There is one sump at the bottom of the downcast airshaft. Water collected here is pumped through a borehole to a reservoir on the surface for later use underground or at surface facilities. This reservoir is connected with the working faces by pipeline. Four-in. iron pipe is used along the main line, three in. pipe on the face entries and 1¼ in. pipe on the butt entries as far as the loading heads. From that point, water is carried by a rubber hose to the cutting machines for dust abatement. There is also a spray on each loading head and at the dump on the shaft bottom. The surface reservoir provides a 200-ft static head and furnishes water to all faces at a pressure of about 90 psi.

In addition to the sump near the downcast air shaft, there is a large sump at the top of the north side which catches all water from the surface outcrop in that area. This sump is used as a reserve water supply and water in it can be pumped directly into the water line should a break cut off the main supply. Generally, however, this water is pumped to the surface through a near-by bore hole.

Fire hydrants have been installed along the main haulage roads every 700 ft. In addition to these permanent fire stations, a self-powered fire engine is kept ready on a siding at the man portal. It has an 800-gal tank, kept full of water, and 800 ft of fire hose. The pump on the tank furnishes water at a pressure of 150 psi. Foamite fire extinguishers and fog nozzles are also standard equipment on the fire engine. An important adjunct to this piece of equipment is a supply car kept on the same siding. It contains brattice cloth, tools, timber and other material valuable in fighting fire underground.

Get Extra Production

As mentioned earlier, the mine works only two full shifts and the five crews which operate on the midnight shift stockpile their coal. Two of these are just two-man crews; appropriately called "rootin'" crews. It is their job to load out any coal that has been prepared in excess of a standard leave on each section. A standard leave for all units at Powhatan No. 1 is one place shot down and one place drilled up. The crew that left it gets credit for all the coal loaded from the section by one of the "rootin'" crews. One of these crews has loaded as high as 190 tons in a shift. The average runs about half of that though, or around 45 tons per man. This is indeed cheap coal and since the crew that prepares it is given credit for it, each unit on the afternoon shift strives to leave as much coal prepared as possible.

Although production is now 5400 tpd, mine management anticipates 6000 tpd production after adding a couple of midnight crews and going completely over to roof bolting. Records at this mine show an increase in production of four tons per face man in sections that have converted from timber for roof support to bolts. In addition, direct costs for roof support have been reduced on bolted sections.

To clean out old entries that have caved and to dig large sumps, an old three-drum Sullivan slusher is used. In cleaning up fallen air courses, an advance of 50 ft is made for each set up of the slusher. One man operates the unit, shifting his own cars. With this system he can load out about 75 tons of material per shift. Management states that this is the cheapest way they have found to handle the job of cleaning up old falls.

Twenty-five ton motors are used on main line haulage

Maintenance and Supplies

Mine mechanics are on duty in the mine during the working shifts and minor repairs are made on the section. If a mechanical breakdown is serious, either the damaged piece of equipment is replaced by a machine from an idle section, or the entire crew is moved to an idle section. At the present time major overhauls are performed on the surface, however, an underground shop and supply house is being constructed near the man portal. When it is completed, all mining equipment repairs including overhauls will be made underground.

Supplies are loaded at the surface and dropped into the mine on the day shift in 13-ton cars. They are distributed on the third, or "hoot-owl," shift.

Men travel to and from the working face in Differential man-trip cars. The work week starts with the "hoot-owl" shift that goes in at Sunday midnight. It and the day shift change outside as do the day and afternoon shifts. However, the change from afternoon to midnight shift is made on the sections.

Coal Preparation

At the shaft bottom, loaded coal cars go through a rotary dump. Each car load of coal is split between two skip pockets. On the surface the six-ton capacity skips dump into a 30-ton surge bin from which coal is fed onto a primary shaker where the ¾-in. by 0 and ¾ by 8 in. material is taken out. Plus 8 in. is fed onto a picking table where three men pick out the slate after which the coal is crushed and fed back with the ¾ by 8-in. material from the primary shaker. The ¾-in by 0 material is broken down to ¾ by ⅜ in. and ⅜ in. by 0 on a tri-deck Allis-Chalmers vibrating screen. Ripl-Flo screens are used with a ⅜ by 2½-in. opening. The larger size joins the ¾ by 8-in. material and is then fed to a Roberts & Schaefer hydroseparator. Feed to the hydroseparator is therefore ⅜ by 8 in. Float from the hydroseparator is sent to a Chance cone and is washed at 1.45 specific gravity. Clean coal from the Chance cone is fed to classifying screens for dewatering and then sized to order for shipment.

A reservoir on the surface supplies water for surface facilities at the man portal and for dust abatement underground

The ⅜-in. by 0 material is fed directly to a Roberts & Schaefer air cleaner. Coal from the air cleaner goes to the clean coal belt for shipment.

The hydroseparators, actually there are two of them in parallel, are used as scalpers. They were installed some time after the original plant was constructed in order to increase plant capacity. All big rock is taken out here, giving the Chance cone, in effect, a greater clean coal production. The plant is now rated at 425 tph of clean coal. Experience has shown that addition of the hydroseparators increased the plant capacity 100 tph.

Make-up water is fed to the plant at the rate of 400 gal per operating hour. Plant bleed is sent to a 1½-acre settling pond adjacent to the plant before draining off into the Ohio River. Sand used in the Chance cone is almost one lb per ton of feed to the cone.

Roberts & Schaefer cyclones are used to trap dust from the air cleaners. This dust is sampled regularly and if quality warrants is loaded out as coal. However, material from the dust collector is generally classified as refuse.

About 50 percent of the clean coal from the plant is loaded on river barges and about 50 percent for railroad shipment. If the situation demands, clean coal can be loaded into railroad cars and stockpiled there. These cars can then be dumped later and the coal from them fed back onto the clean coal belt, by-passing the tipple. This gives a good deal of additional flexibility to plant operation. Barge loading is independent of railroad-car loading and both operations can be carried on simultaneously.

Reject from the plant runs about 18 percent. This, however, does not include the draw slate that is loaded out separately at the face. It doesn't get into the plant. When slate cars are dumped on the bottom, the attendant signals the top man who diverts the skip load of slate into a slate bin. All refuse is trucked to a nearby gob pile.

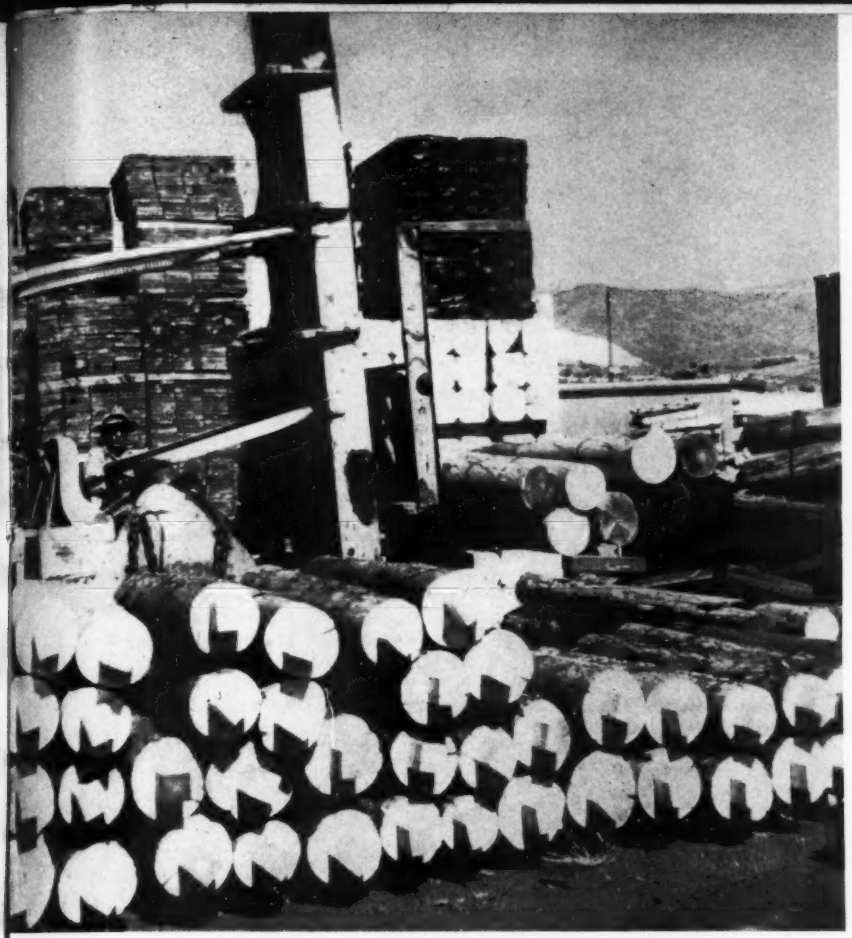
Mine Management

Production at Powhatan No. 1 is under the direction of Mike Yonko, general manager of Powhatan No. 1, No. 2 and No. 3 mines. Chas. S. Winters is mine superintendent and Edward Fellabaum is mine foreman. Two shifts foremen are in charge on the afternoon and night shift. During each of the two shifts that the mine is dumping coal there are six face foremen and on the midnight shift, the stockpiling shift, there are three face foremen. Two mechanization foremen work the day shift also. Their particular duties include coordinating underground operations. Each is in charge of one-half of the mine and they report to the mine foreman.

Maintenance is under the direction of a maintenance foreman on the day shift and an assistant master mechanic on the afternoon shift. There are three transportation foremen, one on each shift. Two firebosses, one full time and the other part time, are employed and are under the supervision of the mine foreman. Each face foreman makes a fire boss run on his section or sections for the oncoming shift. The fire bosses make the inspection before the first shift goes in at Sunday midnight and also inspect sections that are idle on the midnight shift for the oncoming day shift.

Because of pyrite boulders in the bottom, coal is center cut

If the drawslate is over 12 in. thick it is not loaded with coal



The fork lift truck cut down on handling expense on surface

Handling Materials at Lark

Mechanized Supply Transfer Helped Increase Mine Output, Decrease Unit Costs

By H. H. WELLS

Superintendent Lark Section
U. S. & Lark Mine
United States Smelting Refining and Mining Co.

PERIODIC introduction of new and improved industrial equipment has made it possible to continue a mechanized trend that has been in effect for several years at the U. S. and Lark Mine of the United States Smelting Refining and Mining Co. Mechanization in general has been most important in maintaining production schedules when sufficient labor could not be obtained.

The U. S. and Lark Mine is located in the Bingham area of the West Mountain Mining District on the east slope of the Oquirrh Range, some 28 miles southwest of Salt Lake City.

The mine is operated through three main vertical three-compartment shafts all serviced by the 21,200-ft Bingham Tunnel. The No. 2 Shaft is 3200 ft deep with level intervals of 200 ft. The No. 3 shaft is 1000 ft deep, also with levels every 200 ft. The Lark Shaft is 1000 ft deep with levels at 500-ft intervals. These connect with and service operating inclines, and are the elevations at which major exploration drifting is done. Levels from the inclines are spaced 200 ft apart on the dip, 80 ft apart vertically.

Ore bodies are both fissure and replacement type within an east-west trough of sediments lying between twin porphyry stocks. Both bedding and fissure-type deposits rake downward for distances of from 1000 to 3000 ft at angles of from 15 to 90°.

Except for minor interruptions, production has been continuous since 1899. Production in 1953 amounted to approximately 1200 tpd of lead-zinc ore. Also, a total of 28,000 ft of drift and 7000 ft of raise was driven.

Mining methods are varied to fit individual variations in ore deposits and physical conditions. Two methods most widely used are longwall and horizontal back slice. Ground conditions require close timbering regardless of stoping methods used.

Bottlenecks Developed

As most of the ore-producing structures in the Lark Shaft area lie on an incline of 25° and dip away from the vertical shaft, service to the major producing sections became a serious problem as mining progressed downward. It became increasingly difficult to get ample supplies to the working faces when needed and without costly delays. Gradual depletion of ore reserves on the upper levels transferred a greater portion of the ore-production burden to the lower levels, thus creating severe bottlenecks in the material-handling operation prior to the mechanization program which was initiated in 1948. All supplies, particularly timber, were handled manually. Some timber, in the course of distribution, had to be handled seven times!

A brief description of the cycle of timber-handling operations from the time the timber arrives at the plant to its ultimate destination underground might better point out the problems involved. A railroad carload of lagging, for example, was unloaded piece by piece and carried to the nearby storage area. Heavy dimensioned timber was lifted from the car and placed on slides guiding it to the timber pile. Depending upon the type of railroad car, from 32 to 48 man-hr were required to unload and stack the timber in the mine yard. Timber ordered for underground use —approximately 22,000 bfm daily— was hand-loaded from the various piles onto mine trucks. When the timber arrived at the vertical shaft, hoisting of muck was suspended, while the timber was loaded on cages and lowered to the designated levels. Timber lowered to the 500 level was loaded on trucks and transported to the footwall incline where it was in turn lowered to various levels. From the incline stations it was again loaded on mine trucks and distributed to the working places. At each of the

Formerly timber was man-handled up to seven times

above transfer points every piece of timber was handled separately, requiring an excessive amount of labor and time. In most instances the same facilities were used for both hoisting of muck and for lowering supplies. Since these facilities were being used to near capacity, no increase of ore production could be contemplated without radical changes in the methods of handling material and equipment.

Supply Handling a Problem

Handling materials and supplies at the mine has always been a major operation. The annual consumption of timber, rails, air and water pipe, powder, and miscellaneous supplies approximates 7849 tons.

This large quantity of supplies coupled with rising labor costs and the shortage of manpower pointed to a need for greater efficiency in material-handling methods. This could be accomplished only by the introduction of mechanical equipment wherever feasible.

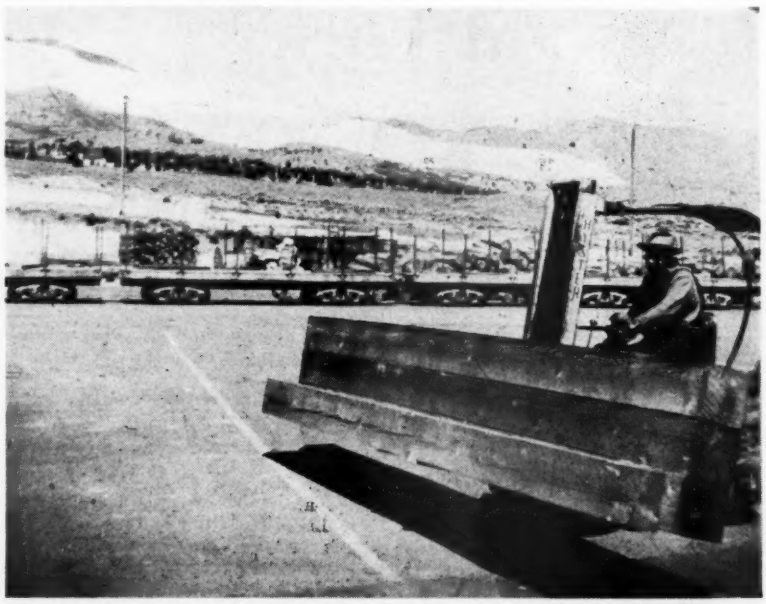
Development of the fork-lift and straddle trucks and their successful use in other industries suggested their possibilities in handling packaged timber and supplies in our operations. Late in 1948, a 7½-ton lift truck and a seven-ton straddle truck were purchased. Later a small one-ton lift truck, now used almost constantly for general utility work, was obtained. Requirements of material and equipment for strapping and packaging were determined and procured. Providing a yard bed over which the machines must travel is a most important factor in establishing an efficient handling operation. To this end a small trial timber-shortage area was at first hard-surfaced and worked with excellent results. The present surface storage yard comprises an area of some 66,000 sq ft and is entirely hard-surfaced. The yard is divided into sections with clearly painted lines, indicating specified areas for various sizes of timber. Additional areas provide space for round poles, pipe, rail, heavy machinery, and other equipment.

All timber now received at the plant is unloaded by the large fork lift, transported to the allotted sections in the yard by both the fork and straddle trucks and then is placed in stacks more than 20 ft high. Handling of bundles is facilitated by the use of spacers which permit the machines to pick up and deposit loads without delay.

Dimensioned timber is received strapped and packaged from the lumber mills in bundles no larger than 24 in. by 32 in. in section. The size of the bundle is governed by the size of the skip in the auxiliary compartment of the Lark Vertical Shaft. Strapping operations at the mine have been extended to include timber framed at the plant, round poles, rails, pipe, and roof bolts. Timber to be cut and framed is taken from the stacks and delivered to the saw mill by the fork lift. After being cut, it is bundled and moved to the storage area or placed directly on mine trucks. Drift sets and square sets are often packaged as a unit and when ordered are delivered intact to the face of the headings. In 1953, 12,400 lb or 134,700 ft of ¾-in. and 1¼-in strapping material and 24,000 buckles were used. Packaging timber and supplies and using the lift truck for orderly stacking has proved to be a vast improvement over the costly handling by hand. Housekeeping has been better maintained, inventories more easily kept, and a much smaller storage area is necessary.

Extend Mechanization

Extending the program of mechanical material handling to underground operations was more difficult because of the need to change existing facilities. Confined quarters at the collars of the various shafts made the use of mobile equipment unattractive. A substitute measure was devised which has proved very effective. At the collar of each of the vertical shafts and on the level stations a 10-in. U-shaped monorail was installed from which three-ton electrically powered hoists, equipped with hand-operated crawls, were suspended. A special timber cage was designed and fabri-



A hard-surfaced yard is an important factor in mechanical materials-handling

Packaged timber is loaded on trucks at shaft station for transport to stopes

cated at the plant to handle long or short bundles of supplies in the auxiliary hoisting compartment. Long, angling slots were cut at each shaft station, enabling the cage to be pulled out of the shaft onto the various levels. To return the cage to the shaft, the hoistman need only lower the framework and the cage slides down the slot into a vertical position. Successful operation of this cage has been a major factor in increasing the efficiency of underground timber handling. The equipment also makes provision for lowering long pipe and rail. Large heavy equipment can be loaded onto the cages in the main compartments by the use of the hoist and monorail.

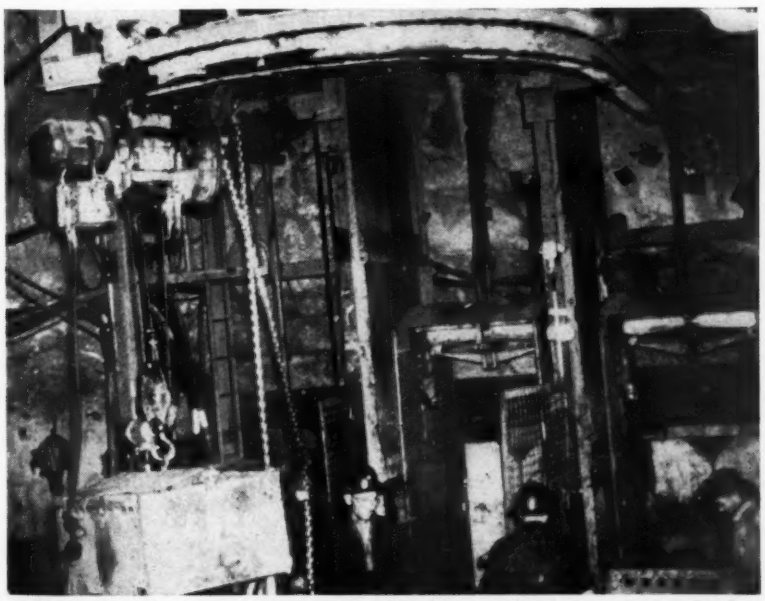
Install Monorail

Material-handling equipment installed at the collar of the incline shaft on the 500 level consists of a slightly curved monorail mounting a three-ton electric hoist. Packaged timbers are picked up by the hoist, transferred to the skip and lowered to the levels below. On the various stations drop rails are installed that allow the skip to run onto the stations. Monorails mounting three-ton hand-operated chain blocks are employed to move the timber from the skip to waiting mine trucks. When loaded on the trucks, the timber is transported to the various underground storage areas or deposited in the top of stopes being operated. Braided slinks of various lengths have been found most valuable as aids in transferring supplies to and from the skips. The banding remains intact until the material is used.

The same type monorail and hoist construction as at the Lark Shaft is installed at the No. 2 and No. 3 Shafts for material handling. Packaged timbers are loaded directly into the cages and lowered or hoisted to the various levels where they are unloaded—again using a monorail device.

The program of mechanizing material handling, both on the surface and underground, has done much to increase mine operating efficiency. Nearly all materials used at the mine are now handled by one mechanical means or another. Rock drills, slushers, pumps, fans, motors, batteries, and cars are typical of the heavy, bulky equipment that can be sent underground or moved from level to level with only a minimum of physical lifting and effort. The warehouse and shops are arranged to provide ample space for fork truck operation, though overhead cranes perform most of the heavy lifting in these buildings.

Savings in manpower and reduced operating costs have been evident results of the mechanization program. Unloading railroad cars which formerly required 48 man-hr, by manual effort, now require only four man-hr with the fork lift. Important savings of manpower have been realized on many other handling jobs about the plant where the lift truck can be employed. Since 1949 surface handling costs for timber alone have been reduced 32 percent and underground material-handling costs have been reduced 12 percent even though wages for the same period have increased approximately 22 percent.

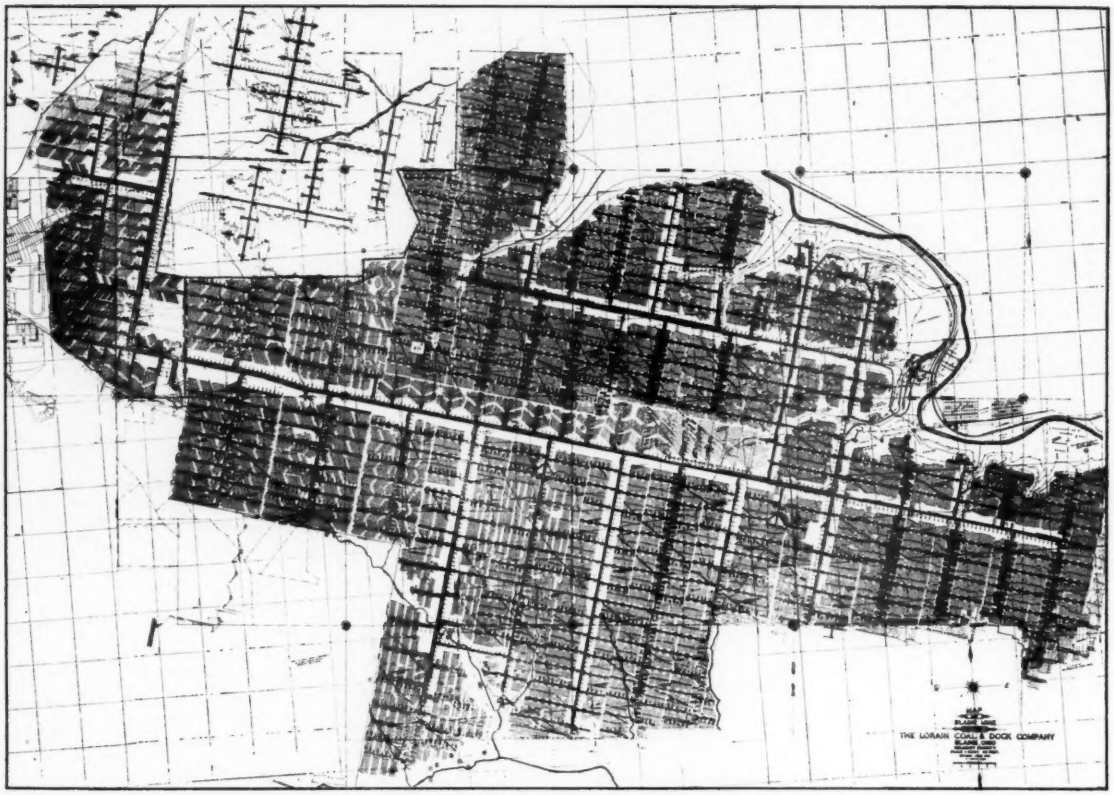


Hoist mounted on monorail aids in transfer of heavy objects from cage to level

Increase Ore Hoisting Time

A very important advantage of underground material-handling mechanization has been relieving the shafts of non-productive hoisting operations and providing more available time for hoisting ore. Mechanization has also eliminated many safety hazards. Accidents resulting from lifting and handling heavy equipment and supplies have been substantially reduced.

During recent years mounting labor and supply costs have pointed directly to the need of improving the efficiency in all phases of mining operations. Material-handling mechanization has made an important contribution toward this objective. Cost reductions were made possible, manpower requirements have been lowered, service facilities improved, inventories more accurately maintained and unit production has increased.



Mine map of the Blaine Mine, Lorain Coal & Dock Co.

Blaine Mine Nears End

Maintain High Efficiency Through Strict Observance of Standards and Close Supervision

NOT all the coal produced in this country comes from newly equipped or engineered mines. Just how much is coming from mines in the last few years of their life is a statistic that would be hard to determine. In many cases, their production is every bit as efficient as that from newer operations. This, of course, reflects good engineering during the opening of the mine and an organization that is efficiently carrying out a preconceived plan.

Opened in 1908

The Blaine mine of the Lorain Coal & Dock Co. falls into this category. Located at Blaine, Ohio, about four miles west of Wheeling, W. Va., it is a drift mine in the Pittsburgh No. 8 seam. It was opened in 1908 as two separate hand-loading mines using common surface facilities. For all practical purposes one of the mines, referred to as the North Side, is worked out. Extensive roof falls make it impractical to go back and recover any barrier pillars that were left. All production now comes from the South Side and it can look forward to less than a year and a half of active life.

The Pittsburgh No. 8 seam here is 60 in. high and is directly overlain by the 12 in. of drawslate, locally called stone, so common in this seam. A 40-ft bed of limestone 17 ft above the coal makes full retreat mining impractical. The limestone is almost impossible to break and, if too little coal is left in place for support, it sags causing a squeeze on the seam. An over-all area recovery of 64 percent is obtained.

Running approximately due west from the outcrop in the Wheeling Creek Valley, the mine at its furthest extent reaches the edge of the downtown district of St. Clairsville, Ohio, about six miles by haulage road from the mine portal. Active mining, however, has retreated from its deepest penetration and most of the present work is in the barrier pillar between the old North Side and the South Side. These workings have been classed as gassy and all proper precautions are taken. The coal dips gently to the southeast in favor of the loads, and the small amount of water encountered runs away from the faces.

Stick to Standards

As mentioned earlier Blaine mine was opened in 1908. It was mechanized in the latter part of 1939 and the first half of 1940. At that time a mechanization survey was made and production standards set. Faithful adherence to these standards over the years has paid off. How valuable

these original surveys were was realized recently when an independent consulting firm was called in to make a similar survey in the light of latest coal mining practice and came up with essentially the same recommendations made in the earlier one.

Standards for all jobs were established in both surveys and a system of production quotas set up. A section foreman must account for all time lost on his section during a shift. Strict rules have been established for what can and cannot be used as an excuse for lost time. A standard leave, that is the condition of the working faces left by the outgoing crew, or setup as it is called at Blaine, has been fixed. A setup in wide work is one place cut, shot and prepared; one place cut and shot; one place cut, and one place posted. In narrow work a minimum setup is one place cut, shot and prepared. If an improper setup is left, the oncoming crew is not permitted to load any coal until it has made a proper setup. An accurate record of the time needed to do this is kept and reported in writing.

An industrial engineer, responsible to the chief engineer, but working solely on production, sees that the standards are properly followed. It is one of his duties to check each section each week to analyze changing physical conditions and assign production quotas for the following week. If these quotas are not met, he then runs a time study on the crew to see what causes the loss in production. He reports his findings directly to the general superintendent, who makes the necessary correction.

Basic standards are published and given to all supervisory personnel. Those standards are strictly adhered to except in certain special cases. If a section foreman wants to make a change in the standard posting and timbering plan or the drilling and shooting plan, he must have a written order from either the mine foreman or shift foreman. This must be fastened securely to the performance sheet and turned in on the day it was issued. In order to miss a place or work out of cycle, the section foreman must also have written permission from the general mine foreman or his assistant. If a crew is found working out of cycle, the foreman in charge is sent out of the mine with a note to the mine superintendent. This note states the facts and the foreman may return to his section only when permission has been granted in writing. With this emphasis on standards and on following them, one can readily see how the entire production is under the close and direct supervision of the general superintendent.

A prepare man is a regular part of the face crew at Blaine mine. He shovels up loose coal and breaks large rock in preparation for the loading machine

Evidently these methods have paid off. Here is an old mine, one with less than a year and a half of life left, operating with old equipment and yet production at the face runs between 19 and 20 tons per face man!

Working Barriers

The barrier separating the North from the South Side mine was originally 500 to 100 ft wide and about 9000 ft long. It is adjacent to and north of the main haulage entries in the Blaine mine. Ohio mining law allows extraction of coal to within 50 ft of abandoned workings if accurate maps of the abandoned workings are available.

The pillar is being opened up by short butt entries off the main haulage entries and mined by rooms driven 60° right and left off the butts. At one time rooms were driven 90° to the butt entries in Blaine, but 60° rooms have been used in later years. Mine management feels that the top is easier to support when angle rooms are used. They advance the argument that slips and planes of weakness in the immediate roof run parallel to the face cleat. Thus, when encountered in 90° rooms, only two cross bars, one on each side of the slip, can be used. With angle rooms, however, the slips cross the room diagonally, allowing more cross bars to be used, thereby giving increased support to the places of weakness.

Timbering, as are all other jobs, is done according to a strict standard

Use On and Off-Track Equipment

Butt entries are driven by small, six-man crews, using trackless equipment. Room necks are turned as the faces are advanced and driven 12 ft wide for five cuts. Rooms are driven in sets of seven. A 40-ft pillar is left between each set for additional roof support. As soon as the butts are driven up, track is put down and the rooms mined by an 11-man crew using on-track equipment.

Top is supported with timber throughout the mine. In rooms, which are 26 ft wide, posts are used in addition to cross bars. Two or three rows of posts are set on each side of the track which is in the middle of the room. Delays because of roof falls can be called lost time in the production report of the section foreman only if place has been properly timbered and then falls in. Lost time on timbering cannot be counted unless a place was left improperly timbered. Then it is considered as not having been timbered and reported as such.

Drilling at the face is done with post-mounted Chicago Pneumatic drills using tungsten carbide tipped bits. A 2½-in. hole is drilled to receive an Airdox cartridge, all shooting being done with Airdox. In wide places, four holes are drilled in the slate. Full seam mining is practiced and the top coal is shot down with the slate. One of the coal holes is a snub shot in the center of the face, angled to just touch the bands at the back of the cut. In narrow work, 12 ft, two holes are used in the stone and three in the coal with one being a snub. At first appearance, it would seem that the coal is undershot. Close supervision, however, assures proper execution of the drilling pattern which is designed to produce large amounts of lump.

For the most part, mine production goes into a premium market with the large sizes in great demand. There is a good bit of truck business a large part of which supplies the local domestic market.

Low Bit Costs

Undercutting at the face in both track mounted and trackless section is done with Goodman shortwall cutting machines equipped with a 7½-ft cutter bar. Cutting machine bits are sharpened and tipped with a hard weld at the surface. One man operates the Sullivan bit sharpner, taking care of the bit requirements at Blaine and the nearby Stanley mine of Lorain Coal & Dock. An over-all mining machine bit cost of 0.5 cents per ton is maintained. When clay veins are encountered, cutting machine operators are instructed to "peel" the coal off so that the clay vein can be seen the full width of the place. They are then to await orders from the general mine foreman or the shift foreman before proceeding with that cut. When clay veins are cut, the machine is sumped only half way up, reducing the load on the cutting machine. Ventilation must be carried up to the clay vein with canvas before it is shot.

Joy 7 and 11 BU machines are used for loading.

At Blaine mine there is a man on the face crew not usually seen at other properties. He is called the "prepare man." His particular duty, as the title implies, is to prepare each place for the loading machine. He breaks all stone into pieces small enough to be handled by the loader and shovels loose coal to the center of the roadway so the loader can pick it up. If a place is not prepared, the loading crew can take time to prepare properly and report the lost time accordingly.

Undercutting in both track and off-track sections is done with shortwall cutting machines

Transportation

In off-track sections coal is taken away from the loading machines with a 42 E-5 shuttle car. Elevating conveyors are used at the loading heads and Brown-Fayro cable hoists advance the trips on the loading heads.

Link and pin coupled, 5½-ton capacity, drop bottom mine cars are used. At the present time only one main line haulage motor is required. It is a 15-ton Jeffrey. Two 10-ton Jeffrey locomotives are used as swing motors, supplying empties to all sections and gathering loads for the main line motor. Six-ton Jeffrey cable-steel motors are used to handle cars in track sections.

The main line haul is now about two miles long. An average main line trip contains 32 cars. At the tipple, the 15-ton motor disconnects at the scales and runs around the trip to couple onto the tail end. The trip is then pushed through the tripper and when the entire trip is dumped, it is taken right back into the mine.

One pressure fan is used to ventilate the mine, furnishing approximately 42,000 cfm of air at two-in. water gauge. The main line haulage road is used as an intake entry. Two Canton automatic mine doors, far enough apart to admit a main line trip and just in by the mine portal, permit traffic to travel the airway without short circuiting fresh air to the outside.

All working faces are now on one split of air. However, separate fresh air splits are provided for the underground shop and an underground substation in compliance with mining law. Most of the air is now being returned to the outside through a 48-in. core-drilled airway and escapeway shaft near the top of the property. Enough air is allowed to flow into and over old workings to keep them under a positive ventilating pressure, the air reaching the surface through abandoned openings to the surface.

To ventilate active working places, stoppings are placed across the main entries forcing the air into the short butt entries. Doors, of course, are used on the main haulage way.

At present a pair of air entries is being driven parallel to the main line in the barrier pillar to allow a return airway if and when the 48-in. air shaft becomes inaccessible. Mine management has not decided whether or not they will mine away from the shaft.

Try New Machines

Despite the impending closure of Blaine mine, management has not been lax in trying new ideas. They experimented with underground augers for quite a while but found that it was impossible to control deflection. A continuous mining machine was in use until recently. Because of the nature of the mining, however, this method of mining had to be stopped. Much of the area being mined at the time was near abandoned workings. This required constant test hole drilling which interrupted the work of the continuous mining machine to the point where production was curtailed.

Maintenance is under the direct supervision of an inside chief mechanic. He runs the underground shop and has several mine mechanics working for him. All maintenance with the exception of major overhauls is done underground. This important phase of mining has also been dealt with by company standards. At the end of the shift each loading machine is to be left near a grease station on the section. The section foreman is responsible for seeing that the loading machine is lubricated at the beginning of the shift. He can delegate this bit of authority if he desires, but it is his responsibility in the final analysis.

In the event a fitting fails to take grease, the chief mechanic is called, although the loader is operated until he arrives. If he thinks it necessary he can stop the loading machine and cure the trouble on the spot or he can order the machine to finish the shift and be worked on then.

No lost time is allowed a crew while waiting for freed ropes, tail ropes or swing ropes. Spares must be kept on hand.

Mine management has found that good housekeeping and good production go hand in hand

Preparation

The cleaning plant, which also handles production from the nearby Stanley mine, was opened in 1939. It is a wet washing plant with all 5 by 3/16-in. coal being washed. Rated capacity is 350 tph. The mine and plant work two shifts per day.

Coal from Blaine mine is dumped from the mine cars into a 350-ton surge bin. From here it travels on a 48-in. belt to a primary shaker where the 5-in. by 0 is screened out. The plus five-in. material goes directly to a picking table where coal is picked. This coal can be crushed or loaded directly for shipment. The 5-in. by 0 material from the primary shaker is fed to vibrating screens where the 3/16 in. by 0 is taken out. It is not cleaned. The 5 by 3/16-in. material goes to a two-cell Jeffrey Baum jig for washing at 1.35 specific gravity. A middling product is made in the jig circuit. Material that settles out in the second cell of the jig is reclaimed and crushed to one in. in a hammermill and fed back through the jig.

From the jig cleaned coal is directed over a four-deck classifying screen. The top deck has two-in. openings; the second deck 1¼-in. openings; the third deck ½-in. openings; and the fourth deck is a ½-millimeter dewatering screen. The ½ by 3/16-in. coal, that would be the coal coming off the ½-millimeter dewatering screen, is fed back with the 3/16 by 0 material to make a ½-in. slack. Primary sizes prepared then are a plus five-in. lump; a 5 by 2-in. egg; a 2 by 1¼-in. nut; a 1¼ by ½-in. stoker size; a ½-in. slack; and a 1¼-in. nut and slack.

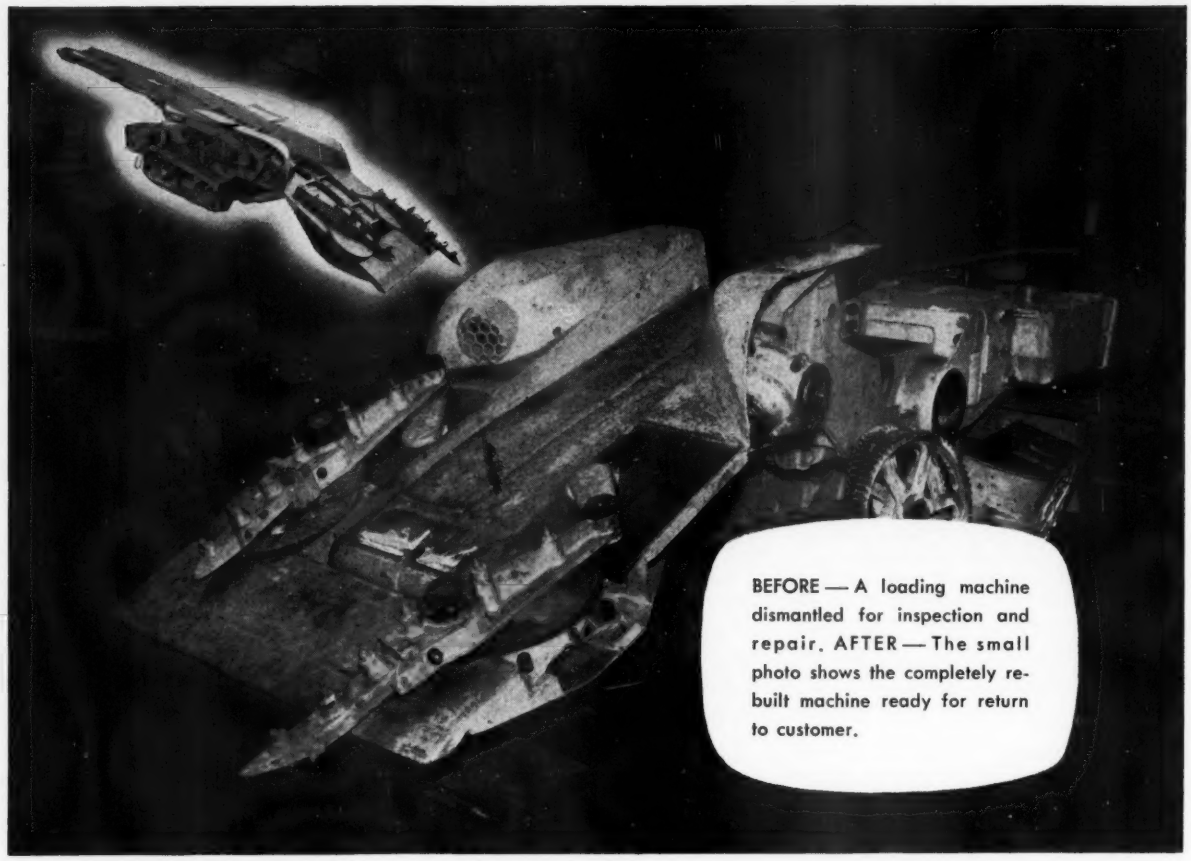
Reject from the plant runs 28 percent and is trucked to a nearby dump.

Approximately 300 tons of coal, mostly domestic, is trucked out daily. The remainder is loaded out on the B & O Railroad. Five-in. lump coal can be stockpiled in the mine yard during periods of light demand for later shipment.

After butt entries have been developed by off-track equipment, rooms are mined with track-mounted equipment

Management

Production at Blaine mine is under the direction of E. G. Schell, general manager of mines in charge of Eastern Ohio and Panhandle properties. Under him is Roy Schell, mine foreman and Martin Lucki, preparation foreman. Marshall Schell is superintendent of machinery and George A. Balloy is chief inside mechanic.



BEFORE — A loading machine dismantled for inspection and repair. AFTER — The small photo shows the completely rebuilt machine ready for return to customer.

New Equipment Performance at Big Savings

. . . When **National** Rebuilds Your Mining Machines

loaders
shuttle cars
mine locomotives
cutting machines
elevating conveyors
belt conveyors

- **all units completely dismantled and every part carefully inspected**
- **parts replaced or rebuilt as necessary**
- **modifications in design and equipment to meet your operating requirements**
- **complete testing before shipment**
- **new equipment guarantees on all rebuilt machines**

two conveniently located plants—Bluefield, West Va. and Harlan, Ky.—both completely equipped for all electrical and mechanical repairs and rebuilding

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

ROEBLING ANNOUNCES TO AMERICAN INDUSTRY IT'S NEW **ROYAL BLUE** WIRE ROPE...

STRONGER THAN YESTERDAY'S STRONGEST! VASTLY INCREASES — EVEN DOUBLES — SERVICE LIFE!

WITH THE DEVELOPMENT of Roebling type 1105 wire — the finest high carbon rope wire ever produced — Roebling leads the field in bringing American industry the unprecedented efficiency and economy inherent in its new **ROYAL BLUE** Wire Rope.

★ Roebling is ready to supply the new **ROYAL BLUE** Wire Rope in EVERY DIAMETER from ¼" to 3½" and in EVERY STANDARD CONSTRUCTION with an independent wire rope core.

★ Roebling guarantees **ROYAL BLUE** Wire Rope to be at least 15% stronger than any standard wire rope of the same size and construction formerly available.

★ Roebling **ROYAL BLUE** Wire Rope has unequalled resistance to impact, crushing, abrasion and fatigue.

Write us for the full story on **ROYAL BLUE** Wire Rope, or contact your distributor or nearest Roebling branch office.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

The Connecting Link in Percussion Drilling

Here is the third and final installment in the series on how to get the most out of hollow drill rod. The kinds of mechanical treatment and how they affect drill rod life are discussed by an expert. How a system of careful controls in the rod shop enabled one mining company to realize the benefits of the fine quality built into its drill steel is told by Calumet & Hecla's quality control manager.

Mechanical Treatment of Drill Steel

By FLOYD R. ANDERSON
Chief Metallurgist
Gardner-Denver Co.

MECHANICAL treatment implies a method of processing used to enhance the service-ability of percussion drill steel. A number of mechanical processing methods have been used and proved of worth. They all depend on the introduction of internal stresses directed toward resisting external loads. In effect, such an approach serves to make the drill steel stronger, to better resist service stresses. With equal justification, the term "mechanical treatment" can include refinements in design which serve to reduce stresses resulting from service. This approach makes it possible for drill steel of standard quality to render superior service. It is entirely possible to combine both types of "mechanical treatment" to obtain the cumulative effect of increased strength and lowered load.

Shot peening, cold rolling and certain methods of heat treatment develop compressive stresses in the surface of metal articles. The first will be described as it is applied to drill steel. As the term implies, shot of a selected size and shape is directed at high velocity against the surface of the drill rod. Compressed air escaping from a directing nozzle or the centrifugal force of a high speed wheel may be used for imparting the necessary velocity to the shot. The shot may be chilled or malleable iron, soft or hard steel in the form of small spheres or hard steel in the form of small cylinders cut from wire. The size of the shot and its velocity are important since they affect the extent and intensity of the peening.

Fig. 1 illustrates the effect of indenting or peening a surface. No surface material is cut away or removed in true peening, it is simply displaced in relation to the sub-surface structure. Peening tends to spread the surface so that it will occupy more area. The sub-surface structure, because of its attachment to the surface layer resists the spreading action and a stress pattern is imparted and locked into place. The surface layer is loaded in compression which is counteracted by tension in the sub-surface layer.

The next figures show magnified sections cut through the surface of steel blocks, not peened and peened.

As stated before, the size and velocity of shot determines the intensity and extent of the peening effect. These factors can be controlled and their effect measured by use of the Almen test which measures the curvature imparted to a thin steel strip by peening only one side of it. Using shot 0.039 in. in diam thrown from an 18 in. diam wheel rotating at 1800 rpm, the depth of peening is 0.014 in.; .055-in. shot at the same velocity displays an effect 0.023 in. deep. The limiting factor to depth of effect is the amount of surface damage that can be tolerated.

Block tests conducted by Crucible Steel Co. some years ago indicated the benefits obtainable in the form of increased service life by shot peening drill steel. Fig. 4 shows results of these tests in which block test life was increased up to 300 percent by shot peening. Note that failure of plain rods originated in the outside surface; with peened rods, started to fail in the tube hole surface.

Since the effect of shot peening depends on a cold working action imparted to the surface of a metal, any heating high enough to anneal

The connecting link in percussion drilling is the drill steel

the metal will serve to eliminate the favorable stresses. Since forging, annealing and hardening of drill steel is necessary in its fabrication, it follows that, for peening to be effective, it must be applied as the final operation in drill rod manufacture.

May Halve Costs

Cost of shot peening drill rods ranges from 1½ to 3 cents per ft and speed of peening ranges from several to 10 fpm depending on the equipment used. This statement of cost assumes production sufficiently large to justify operation of an efficient shot peening machine costing from $5000 to $20,000. Rod service life improvement ranges from nothing up to 300 percent, depending on the nature of operation. Abusive battering and nicking of rods in service

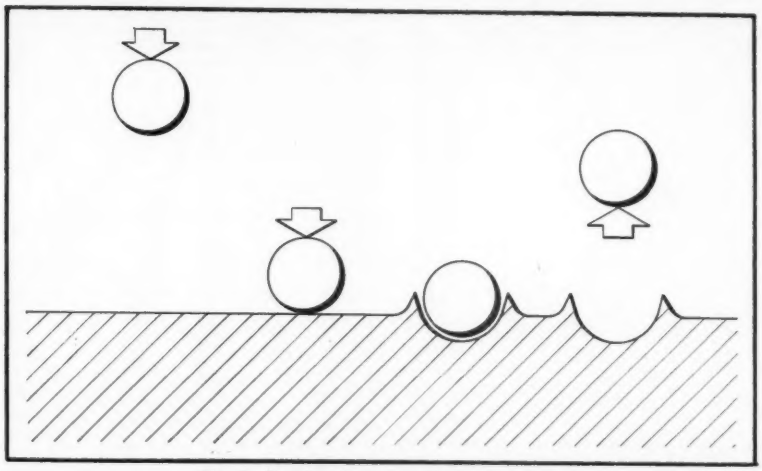
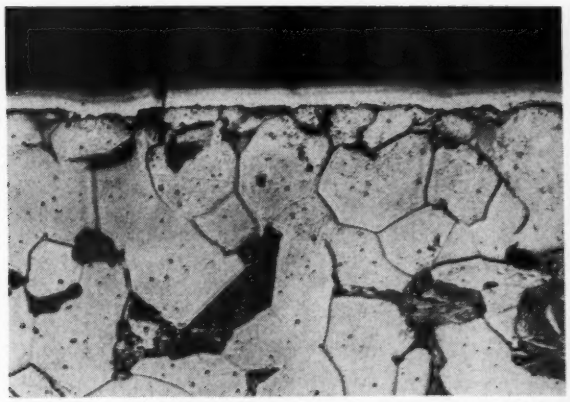


Fig. 1—Peening increases the surface area



Figs. 2 and 3—Surface layer is compressed by peening inducing tension in material just beneath

may completely nullify the benefits of peening. On the other hand, proper use of rods so processed will yield significant increases in service life. The most unkind thing to be said for shot peening drill rods is that it will do no harm. Properly used it may cut rod costs in half. So much for a method of strengthening drill rod by mechanical means.

Studied Design Refinements

By design refinements the loads imparted to drill steel during service may be significantly lowered. One such case was studied and analyzed by photo-elastic methods. Results of the study were applied and service performance proved the complete validity of this approach.

The problem was to improve serviceability of drill rod shank striking ends. By observing suitable shank models made of plastic material by means of polarized light, the effect of applied load could be seen and measured. Various shank end models incorporated various amounts of radius on the outside corner of the striking end ranging from 1/32 to 1/8 in. Loading effect of the piston striking

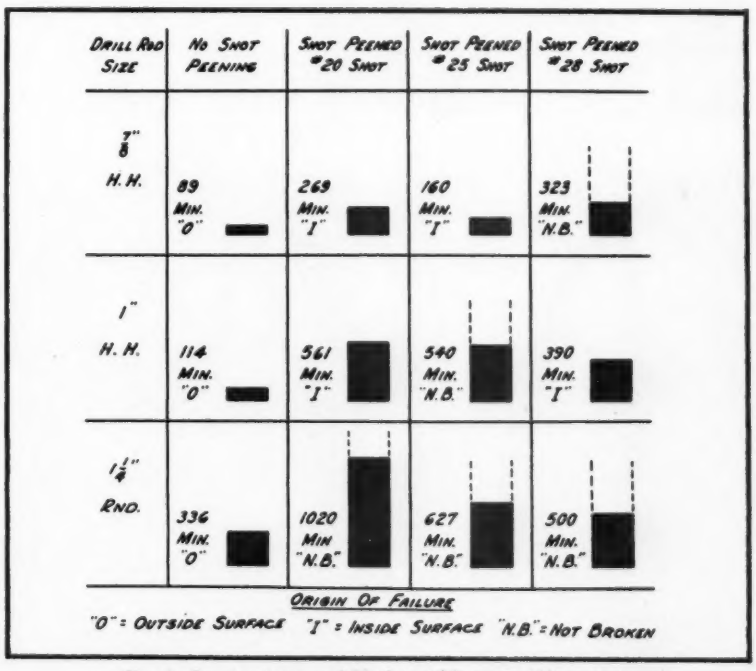


Fig. 4—Peening increased block test life up to 300 percent

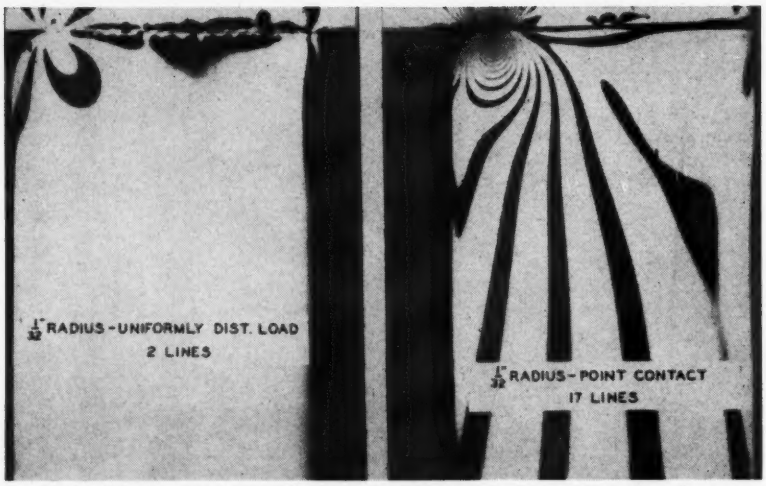


Fig. 5—Misalignment increased stress concentration at corner of shank end more than eightfold

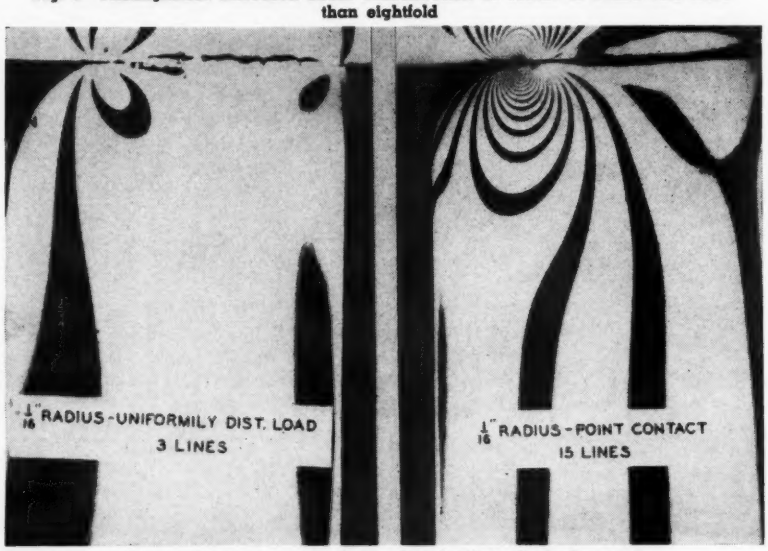


Fig. 6—Longer corner radius reduced effect of misalignment

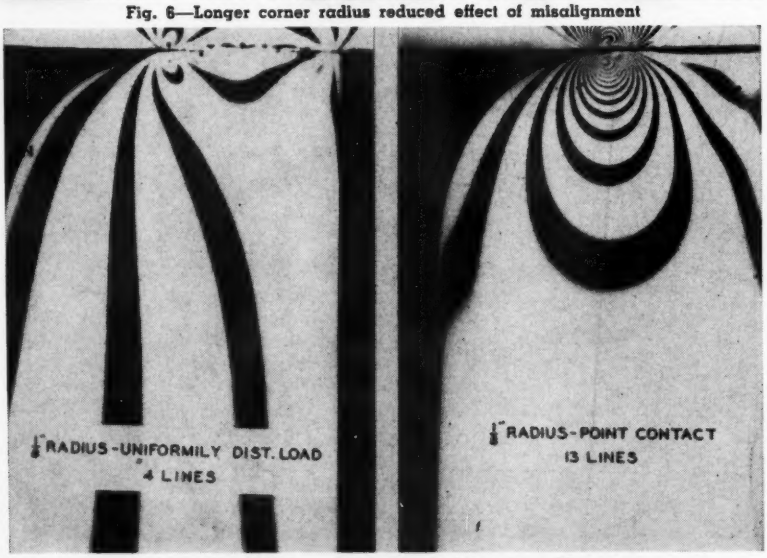
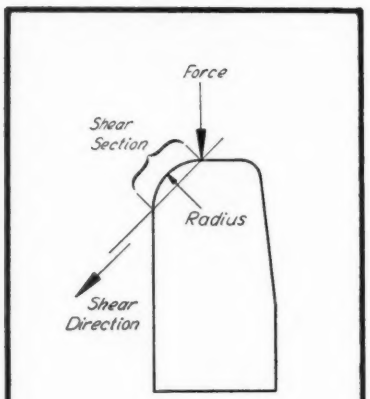


Fig. 7—Use of ⅛-in. radius reduced shear stress 85 percent

the shank was kept constant by using a uniform amount of force exerted by the "piston" against the "rod." Load was directed in two ways: uniformly distributed over the entire shank striking face, representing perfect shank to hammer alignment, and locally concentrated at the outer corner of the shank striking face, representing slight shank to hammer misalignment. Load lines are visible in the loaded specimens indicating the location and intensity of stress. By counting the load lines surrounding the point of major stress, the relative loads under different conditions of loading can be accurately determined.

Figures 5, 6, 7, and 8 illustrate how tremendously misalignment increases stress and also how increasing radius decreases stress.



LOADING UNDER CONDITIONS OF MISALIGNMENT

Radius	1/32"	1/16"	1/8"
Shear Section	.044"	.088"	.177"
Lines Of Force	17	15	13
Relative Shear psi	31,000	13,600	5,800

Fig. 8—Analysis of stress on shank striking end

From these photographs of loaded models it becomes evident that only slight misalignment causes more than an eight-fold increase in stress at the corners of a shank striking end having a 1/32-in. radius. Increasing the radius from 1/32 in. to ⅛ in. promotes a 24 percent reduction in load as indicated by the number of load lines. This, however, is not a final evaluation since the amount of sec-

tion through which the load is applied must be considered in arriving at the load in terms of lbs per square inch.

Failure of shank striking ends may take the form of plastic upsetting or riveting making it difficult to remove the steel from the chuck, or it may take the form of chipping to reduce contact area and damage the piston face. In either case, failure results from shear at 45° to the direction of force as shown in Fig. 8.

This analysis proved that use of a ⅛-in. radius produces an 85 percent reduction in shear stress from that obtained by use of a 1/32-in. radius. Service experience indicates that use of the larger radius satisfactorily eliminates upsetting and chipping of shank striking ends. This is only one example of applying well developed design as another "mechanical treatment," directed to lowering stress which has the effect of increasing the strength of the drill rod.

Control—The Payoff

By R. J. MARCOTTE
Quality Control Manager
Calumet Division
Calumet & Hecla, Inc.

FACTORS involved in percussion drilling and the function and requirements of hollow drill rod have been under investigation for many years. Equipment manufacturers, steel producers, designers, mining men, and research people have cooperated in making available to the mining industry the very best product which their combined effort is capable of producing.

Producers of hollow drill steel have built into their product a performance potential which is seldom fully realized in the field. All too many drill shops accept this steel, which has been produced to exacting specifications, and proceed, unintentionally, to abuse and mishandle it in the forging, machining, heat treating, and other handling operations incident to rod manufacture, producing a rod which quite often gives poor performance. The usual conclusion is that the steel is poor quality, and the search is continued for new and better steel. Eventually, a steel is found which is least affected by the particular type of unintentional abuse administered by this particular shop and is, therefore, adopted as a superior steel. Since, generally speaking, plain carbon steel will withstand more abuse than will alloy, it is not surprising to find many such shops favoring carbon steel.

It is not intended here to recommend the use of any particular steel, but rather to stress the opinion that many shops, and it is certainly true of ours, are not in a position to make a selection as long as performance records indicate that rod failure is continually occurring in the rod ends which were fabricated and treated in the shop. Such failures are, we believe, merely a reflection of poor or inadequately controlled shop practices.

Proper heat treatment increased rod's drilling life from 100 ft to 400 ft

Drilling Program Affected

In December 1953, our jack-leg drilling program was beginning to bog down because of short rod life, which was averaging 100 ft per rod. In our Centennial mine the average was 98 ft, with failures distributed as follows:

Riveted or peened shanks	39 percent
Thread failures	9 "
Broken rods	52 "

Proceeding on the plan of attacking the weakest link, we suspected, and subsequent testing revealed, that all of our rods had a very pronounced metallurgical notch. Further, we were able to show, by examining broken rods, that the failure was, indeed, occurring at the notch. Through experimentation and with the aid of the Rockwell Hardness tester, we were able, with a modification of heat treatment, to produce experimental rods in which the notch was materially lessened. Shop practice was modified to incorporate this new procedure, and rod life in the mine immediately increased. Failure through breakage was practically eliminated, but this merely accentuated the peening or riveting failures, and they immediately became our prime concern.

Oil Quench Solved Problem

Though the peening was obviously attributable to soft shanks, a hardness check revealed that the values which we were obtaining corresponded exactly with those suggested by the steel manufacturer, who, incidentally, was recommending air quenching for hardening. We reasoned that, in order to obtain greater shank hardness, it would be necessary to deviate from the recommended practice and to oil quench and draw. This we did, and our peening failures practically disappeared. Rod life increased and the spotlight again was turned on rod breakage and thread failures. New improvement in technique effected a further reduction in the metallurgical notch with another corresponding improvement in rod life.

As of July 1954, the results for Centennial mine were:

Rod life—313 ft (320 percent of the December 1953 performance).

Failures	Percent of Total	Average Life on Failed Rods (ft)
Peened or chipped shanks	8	263
Fatigue failures, heat treat zone	38	400
Center break	5	685
Thread or button	49	216

(Miscellaneous failures not attributable to rod are not included, i. e., ring off, plugged rod, bent rod, or stuck in hole.)

Furnace at Fault

The possibility for greatest immediate improvement obviously lies in the reduction or elimination of thread and button failures in which 49 percent of the rods fail after only 216 ft of drilling. To date, little has been done in this direction, but each of the other improvements has accentuated this type of failure. Here, as in the case of the peened and chipped shanks, there are indications that we suffer at times by too low a hardness and at other times by too high a hardness. We feel that one of the principal sources of trouble is the variability introduced by the coke furnace currently being used for heating for forging—variability both in temperature and in the furnace atmosphere, which, under certain conditions, can produce excessive scaling and decarburization. Admittedly, this represents poor practice, and we are planning the installation of a new controlled temperature, gas fired, forging furnace, which should improve the consistency of product.

Broken rods constitute 42 percent of present failures, yielding a rod life of 400 ft. This item is, again, definitely in need of attention, and, though the metallurgical notch has been greatly minimized, it has not yet been eliminated completely and further improvement is expected. Elimination of the notch may not be the panacea for this type of failure. Examination of broken rods has revealed an increasing incidence of fatigue failure originating on the inside of the rod. About 50 percent of the breaks occur in this manner. It is believed that these failures originate at pits resulting from corrosive action and a study is being begun to determine the beneficial effects of coating the rods with corrosion inhibitor prior to sending them into the mine. A cursory examination of returned rods indicates that they suffer considerable corrosion, and the effect of this on rod life warrants investigation.

It may, or may not, be significant that five percent of the rods failed in the center unfabricated portion after an average of 685 ft of drilling. Barring corrosion effects, this footage may be the threshold failure value characterizing this particular steel for our service. When a large percentage of failures occur at random in this manner, we should be in a position to blame the steel and seek a better one.

Close Supervision Needed

The annual or semi-annual visit of the steel company representatives cannot in any way be constituted as control—nor can the occasional, though much more frequent visit of the plant metallurgist. Shop control requires the full-time effort in the shop of at least one person whose sole concern is process control and rod quality. In our shop, this function is served by a representative of the Quality Control Department, who, working in close cooperation with the shop manager, performs the following duties:

(1) Checks incoming steel for straightness and eccentricity of water hole.
(2) Spot checks machine threading operation with "go" and "no go" gauges.
(3) Visually inspects quality of thread cutting to keep surface flaws at a minimum.
(4) Checks water hole for size and taper.
(5) Checks heat treating process to make certain that rods are being properly advanced (overlapping the heat) for the correct length of time.
(6) Checks temperature controls of the hardening, annealing, and draw furnaces, and checks forging temperatures.
(7) Checks annealed rods for hardness to make certain that the annealing process is under control.
(8) Spot checks Rockwell Hardness of shank and thread ends of finished rods.
(9) Checks finished thread end by screwing on a new bit to be certain that it seats properly against the collar and is not loose fitting.
(10) Daily makes Rockwell Hardness traverse of both ends of a finished rod to determine the location and the severity of the metallurgical notch.
(11) Examines rods returned from the mine and classifies failures.
(12) Checks steel prepared for special tests in the mine.
(13) Reports any deviation from latest recommended procedures and standards to shop manager, who immediately takes corrective action.

Such a program couples shop control and practical research. It assures constancy of outgoing quality, and eliminates the situation in which corrective action is taken only after a considerable quantity of sub-standard or off-quality material, produced during a period when the shop was "out of control," is encountered in the mine. C & H is fortunate in having mine personnel whose cooperation in conducting special tests and in evaluating rod performance in the mine is proving an invaluable barometer in the improvement of drill rod quality. The enthusiasm with which they report improved performance is surpassed only by the speed with which inferior performance is brought to our attention.

Miners are quick to report improved performance—quicker to call attention to failures

Control—the Payoff

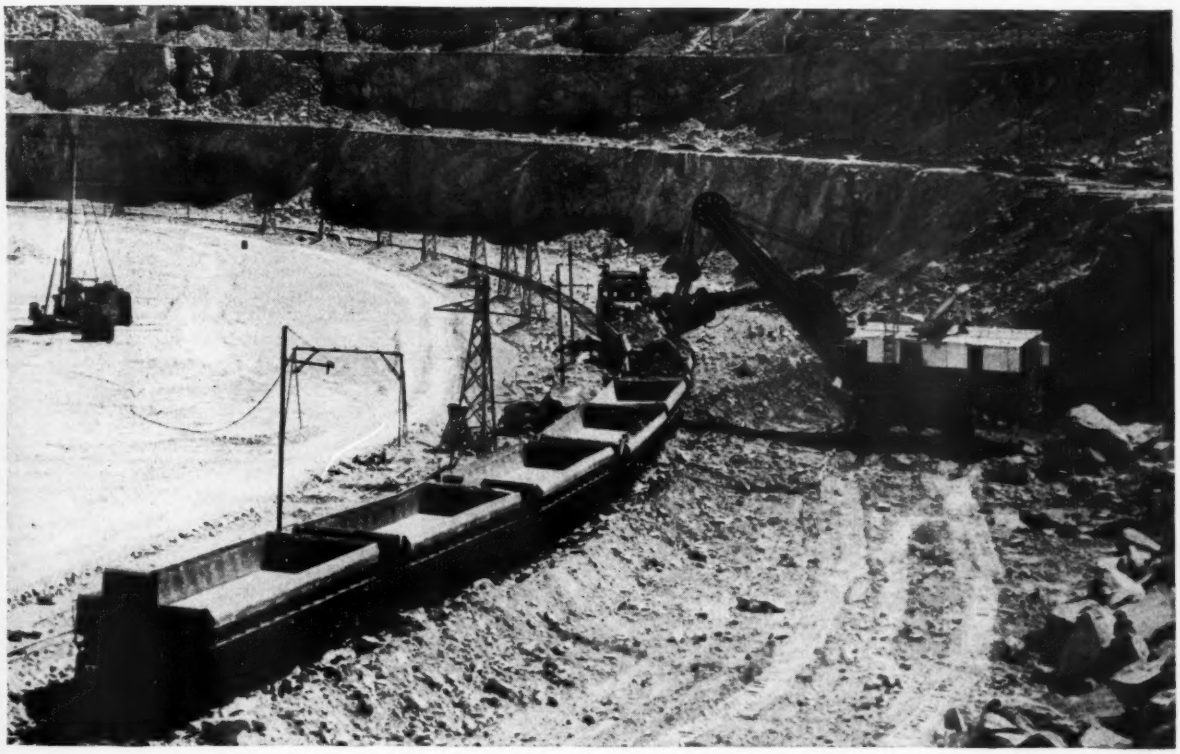
We are convinced of the value of controls and will continue to institute more and better controls and equipment in the interest of improving rod quality as the need is indicated. The resulting slight added cost of rod fabrication is offset many times by the savings realized in mine usage.

Through the exercise of control, the rod shop and, ultimately, the mine can take advantage of the inherent quality built into a given steel and place themselves in a position of being able more effectively to rate one steel against another for the particular service conditions involved.

Where parts must be

EXTRA TOUGH

specify AMSCO® MANGANESE STEEL



Digging! Crushing! Handling! Amsco manganese steel parts work up to 10 times longer under punishment . . . because manganese steel can easily absorb heavy impact and abrasion. Hard work toughens the metal . . . it work hardens to as high as 550 Brinell. The pounding, grating action of rock and ore only polishes manganese steel.

To get maximum life out of your equipment, specify Amsco manganese steel parts from the manufacturer.

DIGGING

dippers and parts
repointers
dragline buckets and parts
dragline chain
sheaves
pinions
crawler shoes

CRUSHING

concaves
mantles
jaw plates
mill liners
hammers

HANDLING

bulldozer blades
tractor rollers, idlers
sprockets, grouser bars
truck beds
grizzle parts
ore car wheels and liners
sheaves, gears, pinions

Amsco also produces other alloy steels with maximum wear resistance under particular conditions of service.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

1955 Coal Show

Heavy Advance Registration Shows Industry's Optimism

IN about two months, thousands of mining men from every part of this country, and a goodly number from across the sea, will be heading toward Cleveland for the 1955 Coal Show of the American Mining Congress in Cleveland's Public Auditorium, May 16-19.

As the opening date of the big four-day meeting draws closer, exhibiting manufacturers are putting final touches on their displays and speakers are polishing up the papers they will present during the Convention sessions. The advance program, printed below, reflects the careful work of the Program Committee. Building on a firm foundation of experience, speakers of high caliber will report on latest advances in deep and strip mining as well as coal cleaning and the problems of management and safety.

More than 220 manufacturers of the machinery, tools and equipment, which coal mining men will use to produce 425,000,000 tons of solid fuel in 1955, will send displays to Cleveland in May. The Public Auditorium's huge exhibit halls will be filled and there will be a number of big displays outdoors. Many exhibits will feature full size machines in operation and each will be manned by trained engineers and technicians, on hand to answer questions and explain the machines on display.

(Continued on page 53)

Hugh B. Lee
President, Maumee Collieries Co.
National Chairman

Advance Program

MONDAY—MAY 16

10:00 am—Continuous Mining

Basic Requirements for Successful Continuous Mining—A progress review showing how seam conditions, operating methods and equipment designs have affected the trends and economic success of this new development.

K. L. Konnerth, Consultant, Pittsburgh, Pa.

A Complete Continuous Mining System—Describes experience over the past several years that has led to the present successful system in which entries, rooms and pillars are mined with continuous machines.

F. Earle Snarr, Vice-President, Chicago, Wilmington & Franklin Coal Co.

Maintenance of Continuous Mining Equipment—This account, based on a Coal Division Committee Study, shows how planned maintenance will lower operating costs and increase tonnage production.

Wm. E. Hess, Manager of Coal Mines, Vesta-Shannopin Div., Jones & Laughlin Steel Corp.

2:30 pm—Annual Meeting Manufacturers Division

TUESDAY—MAY 17

10:00 am—Mechanical Mining

Mechanical Mining in Thick Seams—Shows mining plan in a 12-ft seam, with particular reference to pillar extraction, including roof action, haulage, ventilation and other main operating phases.

R. J. Bowen, Mine Engineer, Columbia-Geneva Steel Div., U. S. Steel Corp.

Mechanical Mining in Thin Seams—Describes the productive and maintenance cycles in 34-in. coal, using bridge conveyors at the face, chain conveyors in the rooms and mine cars on the main line.

A. H. Mandt, Vice-President, Stephens Elkhorn Fuel Corp.

Mechanical Mining and Long Hole Drilling in Pitching Seams—An account of mining methods that have overcome disadvantages of operating on a steep pitch, covering long hole drilling from early experiments to present accepted practices.

G. A. Schnee, Gen. Supt., Philadelphia & Reading Coal & Iron Co.

Maintenance Cost Accounting—From the viewpoint of the operating official rather than the accountant, this paper points out how maintenance records can indicate where cost savings are possible.

Ralph W. Hatch, Statistician, Hanna Coal Co.

10:00 am—Roof Support

Latest Developments in Mine Roof Bolting—Summarizes the knowledge on mine roof action gained through studies on roof bolting and discusses where bolting should and should not be applied.

E. M. Thomas, Mining Engineer, Roof Control, U. S. Bureau of Mines.

Methods and Results with Mine Roof Bolting—An account of roof bolting experience over the past several years in various classes of strata—summarizing both the good and the bad results.

E. H. Greenwald, General Manager, Boone County Coal Corp.

Methods of Partial and Complete Pillar Extraction—Describes pillar recovery in several mining systems, including long face, and shows in detail the methods of roof control and the roof action.

W. F. Diamond, Chief Engineer, Island Creek Coal Co.

Auger Drilling Pillars to Control Mountain Bumps—Explains, with photographs, a technique for controlling mountain bumps which has proven successful and has eliminated lost time accidents.

Woods G. Talman, General Superintendent, Coal Division, U. S. Steel Corp.

2:15 pm—Strip Mining

Two-Seam Stripping and Overland Belt Haulage—Describes a shovel specially built for this operation and also an overland belt conveyor transporting from the strip pit to the coal stock pile.

Wm. W. Dukes, Superintendent, Stonefort Corp.

The Truax-Traer Wheel Excavator—This paper covers general design of this spectacular equipment, including the type and

depth of overburden handled and the method of spoil disposal.

Gene Long, Assistant Mine Superintendent, Traux-Traer Coal Co.

New Improved Truck Designs to Raise Haulage Efficiency—A Panel will discuss possibilities of new construction features in strip mine haulage trucks, for coal and overburden.

H. A. Ravio, Special Representative, Sales Div., Caterpillar Tractor Co.
R. H. Kress, Executive Vice-President, Dart Truck Co.
A. S. McClimon, Manager, Sales Development, Euclid Div., General Motors Corp.
Hoyt Smith, Chief Engineer, LeTourneau-Westinghouse Co.

WEDNESDAY—MAY 18

10:00 am—Foremanship—Maintenance—Cost Control

An Evaluation System for Foremanship and Its Uses—Tells how job performance is examined by a special Board to determine suitability for promotion, to discover supervision problems and decide how to correct them.

E. B. Leisenring, Jr., Assistant to President, Stonega Coke & Coal Co.

Machine Breakdowns CAN be Prevented—Gives the background of a wide experience in applying general and specific principles of preventive maintenance to coal mining, metal mining and industrial plants.

Hugh H. Fraser, Managing Director and **H. E. Hastings,** Director, H. H. Fraser and Associates, Ltd.

Industrial Engineering Applied to Coal Mining—Explains how time studies, work measurements, cost controls and incentives can lower costs and increase productive efficiency.

T. M. Barry, Industrial Engineer, Barry and Co.

10:00 am—Haulage and Power

Considerations in Designing a Mine Haulage System—Stresses the importance of haulage in coal mining, emphasizing the need for proper engineering in designing more efficient practices and equipment.

Stephen Krickovic, Chief Engineer, Eastern Gas & Fuel Associates.

Mechanical Loading into Shuttle Cars—Covers two methods of service haulage with mechanical loading—shuttles delivering to belt conveyors and shuttles delivering to mine cars.

W. L. Husk, Chief Engineer, West Kentucky Coal Co.

Mechanical Loading on Bridge Conveyors—Describes mechanical loading with bridge conveyors from the machine to the room conveyors, which transport to the intermediate haulage.

Myron Kok, General Manager, Warner Collieries Co.

Mechanical Loading Directly into Mine Cars—This operation loads coal at the face mechanically into drop-bottom mine cars which are hauled to the tipple and dumped without further handling.

Joseph Johnson, Superintendent, Perry Coal Co.

Use of AC and DC for Underground Power—Deals with this subject from the viewpoint of the operator rather than the electrical engineer, showing how and where AC and DC give best results.

W. R. Morton, Engineer, General Electric Co.

2:15 pm—Strip Mining

Latest Anthracite Strip Drilling Practices—Describes drilling methods with several types of drills and bits now in use, including a core type drill for securing a seam section.

J. Robert Bazley, President, J. Robert Bazley, Inc.

New Drilling Developments in Bituminous Strip Mining—A review of developments in overburden and coal drilling over the past few years that have increased productive performance.

Forbes Clarke, Field Superintendent, United Electric Coal Cos.

The Akremite Blasting Process for Strip Mining—Employing a new principle, this method is reported to be simple, safe and economical in breaking overburden for shovel and dragline handling.

J. A. Miner, President, Colonial Coal Mining Co., Inc.

Auger Mining Correlated with Strip and Deep Mining—A Symposium in which three speakers tell how auger mining is used to recover "fringe coal" between a strip highwall and the deep mining areas.

Fred O. See, Vice-President, Cardox Corp.
J. M. Poindexter, Sales Representative, Salem Tool Co.
Quentin G. Bullock, Vice-President, Compton, Inc.

THURSDAY—MAY 19

10:00 am—Continuous Mining

Continuous Mining in 42-inch Coal—A resume of several years' experiments in mechanical mining that have resulted in the development of a successful continuous system with two types of machines.

Richard T. Todhunter, Jr., General Manager, Barnes & Tucker Co.

Pillar Extraction with Continuous Mining—An account of a continuous operation in the Pocahontas No. 3 Seam, making a high percentage of recovery in pillar mining.

H. A. Quenon, Division Manager, Eastern Gas & Fuel Associates.

Service Haulage for Continuous Mining—A Symposium describing operations with several types of haulage equipment serving continuous mining machines.

Extensible Conveyors:

M. A. Williams, General Superintendent, Oglebay, Norton & Co.

Portable Surge Cars:

W. C. Campbell, Assistant to Vice-President, Old Ben Coal Corp.

Continuous Mining with AC Power—This mine uses AC power for all underground equipment, and the paper will discuss its application and advantages in a continuous operation.

John Stachura, General Superintendent, Enoco Collieries, Inc.

10:00 am—Coal Preparation

Fine Coal Preparation of Illinois No. 6 Seam—Describes the Crown Cleaning Plant at Farmersville, Ill., where the plus 1½ in. is washed and the minus sizes are air cleaned and heat dried.

Emery Milligan, Preparation Manager, Freeman Coal Mining Corp.

Processing Small Sizes for Competitive Fuel Markets—A mining engineer and a combustion engineer discuss Leatherwood Plant which uses heavy media separation followed by filters, mechanical dewatering and heat driers for the fine coal.

J. S. Snyder, Mining Engineer and **J. E. Tobey, Jr.,** Industrial Sales Engineer, Blue Diamond Coal Co.

Cleaning and Drying Fine Sizes of Pittsburgh Coal—An account of the Mathies Cleaning Plant using cones for the primary separation and tables with centrifugal driers for the ⅜ by 0.

David G. Werner, Preparation Plant Foreman, Mathies Coal Co.

Anthracite Recovery from Silt Deposits at Jeddo-Highland—Describes how 120 tph of silt is treated in cones, classifiers, cyclones and froth cell units, with water recirculation.

H. R. Middleton, Sales Manager, The Wilmot Engineering Co.

2:15 pm—Safety Panel

Accident Prevention in Coal Mines—A Panel Discussion covering specific hazards in coal mining, their causes and preventive measures.

M. J. Ankeny, Safety Director, Bituminous Coal Operators Assn.
James B. Benson, Director of Safety, Southern Coal Producers Assn.
H. T. Batman, Lynch Coal Operators Assn. of Indiana.
J. J. Forbes, Director, U. S. Bureau of Mines.
Edward Steidle, Chairman, Federal Coal Mine Safety Board of Review.
Charles B. Ferguson, Director of Safety Division, United Mine Workers of America.
Frank B. King, Chief, West Virginia Dept. of Mines.
Thomas Allen, Chief, Colorado Coal Mine Inspection Dept.

Members—Program Committee

M. L. Alley
Gauley Mountain Coal Co.

E. M. Arentzen
Lee-Norse Co.

P. W. Bigley
Centrifugal & Mechanical Industries, Inc.

A. P. Boxley
Eastern Gas & Fuel Associates

Ira Coen
Westinghouse Electric Corp.

J. N. Crichton
Johnstown Coal & Coke Co.

C. O. Crump
Sanford-Day Iron Works

M. F. Cunningham
Goodman Mfg. Co.

John E. Davis
Guyan Eagle Coal Co.

Harrison Eiteljorg
Morgan Mines, Inc.

J. S. Forman
Mt. Olive & Staunton Coal Co.

C. A. Garner
Jeddo-Highland Coal Co.

Stanlee Hampton
Tennessee Consolidated Coal Co.

Carl T. Hayden
Sahara Coal Co., Inc.

S. B. Johnson, Jr.
Lorain Coal & Dock Co.

K. L. Konnerth
Consulting Engineer

J. S. Laird
Gay Mining Co.

J. B. Long
Long Co.

Wm. C. McCullough
Roberts & Schaefer Co.

D. L. McElroy
Pittsburgh Consolidation Coal Co.

G. P. Mahood
Bethlehem Steel Co.

L. C. Mosley
Marion Power Shovel Co.

V. O. Murray
Union Pacific Coal Co.

B. M. Neel
Westmoreland Coal Co.

J. W. Overstreet
National Electric Coil Co.

Program Committee *(Continued)*

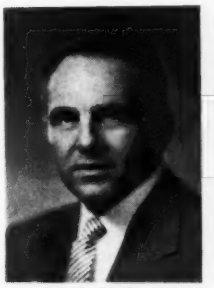
(Photos not available)

Don Johnston
Northern Illinois Coal Co.

W. J. Rude
American Gas & Electric Service Corp.

Sterling S. Lanier, Jr.
Norton Coal Corp.

L. J. Walker
Chicago Pneumatic Tool Co.



E. R. Phelps
Pittsburg & Midway Coal Mining Co.

Fred O. See
Cardox Corp.

F. Earle Snarr
Chicago, Wilmington & Franklin Coal Co.

V. L. Snow
Euclid Div.
General Motors Corp.

A. V. Sproles
Pocahontas Fuel Co., Inc.

R. H. Swallow
Ayrshire Collieries Corp.

George O. Tarleton
Consolidation Coal Co. Ky.

C. E. Walker
Jewell Ridge Coal Corp.

G. R. Watkins
U. S. Fuel Co.

E. C. Weichel
Hudson Coal Co.

J. Wm. Wetter
Rockhill Coal Co.

Guy V. Woody
Allis-Chalmers Mfg. Co.

J. W. Woomer
J. W. Woomer & Associates

Exhibitors—

Here's the initial list of manufacturers who will make the 1955 Coal Show the greatest exhibition of mining machinery, equipment and supplies ever held

ACF Industries, Inc.
Acme Machinery Co.
Aeroquip Corporation
Aero Service Corp.
Allegheny-Ludlum Steel Co.
Allen-Sherman-Hoff Pump Co.
Allied Chemical & Dye Corp.
Solvay Process Division
Allis-Chalmers Mfg. Co.
American Brattice Cloth Corp.
American Chain & Cable Co., Inc.
Wire Rope Divisions
American Chemsol Corp.
American Cyanamid Co.
American Manganese Steel Division
American Mine Door Co.
American Mine Supply Co.
American Steel Foundries
American Steel & Wire Division
U. S. Steel Corp.
Anaconda Wire & Cable Co.
Armco Drainage & Metal Products, Inc.
Ashland Oil & Refining Co.
Atlas Powder Co.
Austin Powder Co.

Baldwin-Lima-Hamilton Corp.
Construction Equipment Div.
Barber-Greene Co.
Bearing Service Co.
Bethlehem Steel Co.
Bird Machine Co.
Bixby-Zimmer Engineering Co.
Blackhawk Mfg. Co.
Boston Woven Hose & Rubber Co.
Bowdil Co.
Brake Engineering Co.
Broderick & Bascom Rope Co.
Browning Dust Collector
Bucyrus-Erie Co.
Buda Co.
Burndy Engineering Co., Inc.

Carboloy Dept.
General Electric Co.
Cardox Corp.
Caterpillar Tractor Co.
Centrifugal & Mechanical Industries, Inc.
Chicago Pneumatic Tool Co.
Cincinnati Mine Machinery Co.
Cities Service Oil Co.
Clark Equipment Co.
Construction Machinery Div.
Clarkson Mfg. Co.
Cleveland Rock Drill Div.
Westinghouse Air Brake Co.
Coal Age
Coal Mine Equipment Sales Co.
Colorado Fuel & Iron Corp.
Wickwire Spencer Steel Div.
Combustion Engineering, Inc.
Raymond Div.
Compton, Inc.
Continental Motors Corp.
Cooke-Wilson Electric Supply Co.
Cummins Engine Co., Inc.

D-A Lubricant Co., Inc.
Dart Truck Co.
Davey Compressor Co.
Deister Concentrator Co.
Detroit Diesel Engine Division
General Motors Corp.
Differential Steel Car Co.
Dodge Mfg. Corp.
Dooley Bros.
Dorr-Oliver, Inc.
Dow Chemical Co.
Duff-Norton Mfg. Co.
Du Pont de Nemours & Co., Inc., E. I.

Electric Steel Foundry Co.
Electric Storage Battery Co.
Exide Industrial Division
Ensign Electric & Mfg. Co.
Enterprise Wheel & Car Corp.
Euclid Division
General Motors Corp.

Failing Co., George E.
Fairmont Machinery Co.
Femco, Inc.
Firth Sterling, Inc.
Fletcher & Co., J. H.
Flexible Steel Lacing Co.
Flood City Brass & Electric Co.
Fuel Process Co.
Fulton Bag & Cotton Mills

General Electric Co.
Goodman Mfg. Co.
Goodyear Tire & Rubber Co., Inc.
Gorman-Rupp Co.
Gould-National Batteries, Inc.
Gulf Oil Corp.
Gundlach Machine Co., T. J.

Hamilton Rubber Mfg. Corp.
Harnischfeger Corp.
Hawthorne, Inc., Herb J.
Hendrick Mfg. Co.
Hendrix Mfg. Co.
Hercules Motors Corp.
Hercules Powder Co.
Hewitt-Robins Incorporated
Hewitt Rubber Co. of Pittsburgh
Heyl & Patterson, Inc.
Holmes & Bros., Inc., Robert

I-T-E Circuit Breaker Co.
International Harvester Co.
Interstate Equipment Division
Yara Engineering Corp.

Irwin Foundry & Mine Car Co.
Jeffrey Mfg. Co.
Johns-Manville Sales Corp.
Jones & Laughlin Steel Corp.
Joy Mfg. Co.

Kanawha Mfg. Co.
Keenan Oil and Fuel Co.
Kennametal Inc.
Kensington Steel Co.
Kern Instruments, Inc.
Knapp Mills, Incorporated
Koehring Co.
Koppers Co., Inc.
Wood Preserving Division

Laboratory Equipment Corp.
Lecco Machinery & Engineering Co.
Lee-Norse Co.
Leschen Wire Rope Division
H. K. Porter Co., Inc.
LeTourneau-Westinghouse Co.
Lincoln Engineering Co.
Link-Belt Co.
Long Co.
Ludlow-Saylor Wire Cloth Co.
Lukens Steel Co.

McLanahan & Stone Corp.
McLaughlin Mfg. Co.
McNally-Pittsburg Mfg. Corp.
Macwhyte Company
Marion Power Shovel Co.
Martindale Electric Co.
Mechanization, Inc.
Mine Safety Appliances Co.
Mining Congress Journal
Mining Machine Parts, Inc.
Mining Progress, Inc.
Mitchell Industrial Tire Co., Inc.
Morris Machine Works
Myers-Whaley Co., Inc.

National Electric Coil Co.
National Malleable & Steel Castings Co.
National Mine Service Co.

National Tube Division
U. S. Steel Corp.
Newcomer Products, Inc.
Nolan Company
Nordberg Mfg. Co.

Ohio Brass Co.
Ohio Carbon Co.
Okonite Co.
Hazard Insulated Wire Works Division
Olin Mathieson Chemical Corp.
Explosives Division
Orefraction Inc.
Osmose Wood Preserving Co. of America, Inc.

Page Engineering Co.
Pattin Mfg. Co.
Penn Machine Co.
Peterson Filters & Engineering Co.
Pittsburgh Screw & Bolt Corp.
Post-Glover Electric Co.
Productive Equipment Corp.
Prox Co., Inc., Frank
Pure Oil Co.

Quaker Rubber Corp.
Division of H. K. Porter Co., Inc.

Raybestos-Manhattan, Inc.
Manhattan Rubber Division
Reich Bros. Mfg. Co.
Reliance Electric & Engineering Co.
Republic Steel Corp.
Robertson Co., H. H.
Roberts & Schaefer Co.
Roebling's Sons Corp., John A.
Rome Cable Corp.
Rust-Oleum Corp.

S K F Industries, Inc.
Salem Tool Co.
Sanford-Day Iron Works, Inc.
Schroeder Brothers
Shell Oil Co.
Simplex Wire & Cable Co.
Socony-Vacuum Oil Co.
Stamler Co., W. R.
Standard Oil Co. (Indiana)
Standard Oil Co. (Ohio)
Stearns Magnetic, Inc.

Templeton, Kenly & Co.
Tennessee Coal & Iron Division
U. S. Steel Corp.
Texas Co.
Timken Roller Bearing Co.
Tool Steel Gear & Pinion Co.
Trabon Engineering Co.
Twin Disc Clutch Co.
Tyler Co., The W. S.

Union Wire Rope Corp.
United Engineers & Constructors, Inc.
U. S. Bureau of Mines
United States Rubber Company
Mechanical Goods Division
Electrical Wire and Cable Department
U. S. Steel Corp.
U. S. Steel Export Co.
United States Steel Corp.
U. S. Steel Supply Division
United States Steel Corp.

Varel Mfg. Co.
Vascoloy-Ramet Corp.
Victaulic Company of America

Watt Car & Wheel Co.
Weatherhead Co.
Wedge Wire Corp.
Wellman Co., S. K.
Western Machinery Co.
Westinghouse Electric Corp.
West Virginia Steel & Mfg. Co.
Whitney Chain Co.
Wild Heerbrugg Instruments Inc.
Wilmot Engineering Co.

Coal Show

(Continued from page 48)

In addition to the thousands of coal mining men who will gather in Cleveland for the Coal Show, there will be many from the metal mining and industrial minerals fields. Their employers have discovered that most of the equipment on display has application to their problems as well as to coal's. They have found too, as coal mining companies did long ago, that it pays to send not only members of the top management group, but also superintendents, foremen, maintenance men, electricians and miners. The increase, year after year, in Coal Show attendance is convincing evidence that the renewed enthusiasm and deeper insight into the industry's problems these men take home more than offsets the investment in time and money required to send them to study the exhibits and take part in the proceedings.

The Coal Convention and Exposition is devoted to the serious business of advancing the industry's progress, but it also has its less serious side. The traditional Coal Miners' Party will be held on Wednesday evening. A special time for fun and relaxation, the party will feature stellar entertainers and a topnotch dance band.

No formal entertainment functions have been planned for Monday, Tuesday or Thursday evenings. Instead, these have been left open for the entertaining and parties that are so much a feature of the fun and good fellowship of Coal Show Week.

Ladies are especially invited to come to Cleveland May 16-19. They will be welcome at the sessions and are particularly invited to visit the Exposition with its many colorful displays. A special program of social events has been arranged for them. There will be a Welcoming Luncheon on Monday; a Luncheon and Style Show on Tuesday and a boat trip and tea on Thursday.

Advance registration for the 1955 Coal Show has been heavy and Cleveland's hotel accommodations will be taxed to the limit. Some hotels are already filled to capacity, but the Housing Bureau has promised comfortable accommodations for all. For those who have not yet asked for hotel reservations, requests should be sent promptly to the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio. The Housing Bureau will also help find accommodations, for those who are planning to drive to Cleveland, in the many fine motels in and near the city.

Time is growing short. Avoid disappointment later and complete arrangements now to be at the 1955 Coal Show. Join all the other mining folk in Cleveland May 16-19.

In 1954 Great Britain invested $235,000,000 in capital reconstruction at its coal mines. Shown above is the colliery at Wallsend, Northumberland

Britain's Power Problem

Imports of U. S. Coal Point Up Inadequate Home Production. Atomic Power and Oil Expected to Help Close "Coal Gap"

BRITAIN, an island "built upon coal," is currently importing this commodity from the United States to plug the gap left by her own inadequate production.

Since with carrying charge added, the U.S. coal is more expensive than the domestic-mined variety, it has to be sold at a loss by the National Coal Board which manages the industry in the U.K.

This situation has naturally prompted gloom and some anxiety in Britain and concern among her friends abroad.

Coal is basic in Britain—essential to the functioning of her industries, necessary in one form or another for providing electrical power, for moving goods on the railways, for making over 90 percent of the gas used and for heating homes.

How bad, then, is the situation? Is a solution to the problem of providing adequate power for Britain's expanding economy, now in high gear and booming as never before, in sight? And if so along what lines does the answer lie?

These questions are being asked in Britain and also in the United States, since in the final analysis the availability of power in plenty is a major factor in Britain's prosperity and her strength as an ally.

Still Exporting

The short answer is that the situation though discouraging is not desperate. U.K. industry is riding the crest of a wave and did not suffer a coal shortage in 1954. Britain is still exporting annually far more coal than she is currently importing, the retention of her established markets in Europe and Scandinavia (where she buys in return some food and raw materials) being of greater importance to her than losses sustained on imported coal.

But, in 1938, almost 40,000,000 tons of coal were exported. In 1954 U.K. coal exports totalled just over 16,000,000 tons, including bunkers; and the national coal output last year—one of the best years since nationalization of the mines—was only 223,000,000 tons, substantially less than the pre-war average.

It has sometimes been asserted in explanation of this coal gap that the British miner has not pulled his weight since the war, that he has been spoilt by too much attention to his welfare and his wages.

Miners' Efforts

These assertions do not bear much examination. In the Yorkshire coalfield, for example, production is improving, though this is an area in which human relations have several times been strained since the war.

Yorkshire mines have increased output by 21.8 percent since 1946 and output per man-shift has risen by 19.6 percent. The East Midlands division did even better. Output has risen in the same period by 38.5 percent and output per man-shift by 25.1 percent. In both coalfields total manpower in 1954 was less than in 1953, so that output per man-year also showed a considerable increase.

These facts argue against the alleged miner's unwillingness to work and suggest the real clue to disappointing production—which lies in the nature of the British coalfields, rather than that of the men who work them.

The East Midlands and Yorkshire fields are rich and the coal comparatively easy to win with modern equipment. Hence the high production and productivity in these locations.

But in other areas, notably large parts of the Lancashire, Scottish and South Wales fields, the coal is becoming harder and harder to get. Mining often has to be carried out at enormous depths. Flooding is a problem, involving in some cases one full shift pumping before other shifts can begin to get coal. Seams are heavily faulted, requiring frequent halts in work while they are rediscovered.

Reconstruction is being tackled energetically. Since 1947, the National Coal Board has invested some $1,120,000,000 gross—the figure includes both new investment and depreciation—and has mechanized mining to the maximum extent (some tortuous seams do not permit of mechanization and in other cases it is uneconomic.)

In 1954 some $235,000,000 was spent on capital reconstruction in the mines and there was substantial research in-

to better use of coal and new means of processing it.

Old and difficult workings, the oldest and most difficult large-scale workings in the world, are therefore the main reason for the production problem. Britain is suffering from her prodigal extraction of her most easily won coal riches in the late part of the nineteenth century and the early part of the twentieth.

Increased Demand

The problem of coal production, still the main source of power in Britain, has been aggravated by the post-war heavy increases in demand for power.

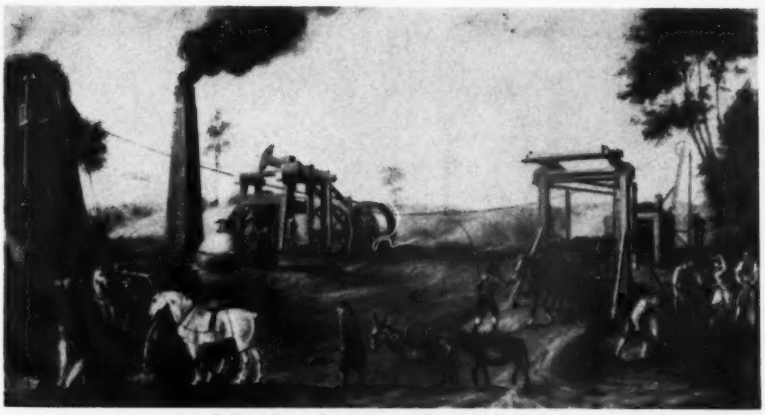
Post-war living conditions have brought more electrification in the home as well as in the factory; large numbers of electrical domestic and industrial gadgets and machines have been marketed. And as a consequence of increased demand for electricity more power stations have been built, requiring still more coal.

Britain's recovery and her present boom have required power; currently the rate of increase in the demand for power needed at the worker's elbow in Britain is higher than anywhere else in the world, largely because ground lost in this direction as a result of war has to be made up rapidly.

Coal Conservation

Nonetheless the picture of Britan's power situation is not so gloomy as it is sometimes represented to be. There is first the fact that her coal resources are far from reaching the point of exhaustion.

The known economically workable resources, around 43 billion long tons, are estimated as being comfortable enough for an annual output rate of 250,000,000 tons for 170 yr. And investigation into what are at present less economic deposits and new means of working them is continuous.



A British coal mine as it looked in 1785

Experiments are being made with underground gasification of coal—potentially an ideal method of using deposits too deep or otherwise unsuitable for mining—though it is early yet to say what this research will yield. Research in user industries is constantly seeking, with some success, ways of economizing coal consumption.

Annual output, even from sources presently being worked, is rising despite the difficulties, although not at a sufficient rate to meet the unrelenting growth in demand.

Finally there are alternative and complementary sources of power which will ease the burden of coal as the nation's prime mover long before the known workable reserves are heavily drawn upon.

These alternatives and complementary sources which will help cope with the general problem of how to meet the rapidly expanding demand for power are principally the use of oil and atomic energy for generation of electricity.

The latter is potentially the more attractive, since atomic power stations have moved into the realms of practical engineering in Britain. Results to date with prototype plant have exceeded the most optimistic expectations of the experts.

Many power experts, however, see a more immediate contribution from oil. Since the war Britain has become a major oil-refining country, the fourth in the world, and plentiful supplies of crude oil are available.

Fuel oil consumption has in fact been rising at the rate of about 10 percent a year, and there is a strong case to be made for regarding it as a more probable short-term alternative for coal in heating, power-generation and some forms of transport than the atom. It is a matter for decision whether new power stations should be equipped for oil-firing as well as for coal burning. The National Coal Board is working in close collaboration with the oil industry.

Atomic Forecasts

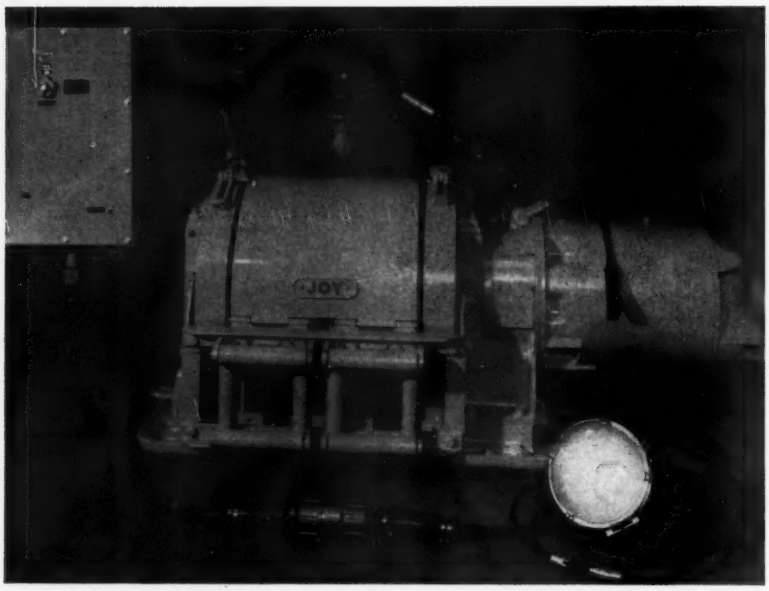
But the short-term importance of oil has not distracted attention from development of Britan's first nuclear power plants. Sir Christopher Hinton, production chief of the U.K. Atomic Energy Authority, has already said that the atom can be used for electricity generation at a cost as low as ½ cent a unit, and nuclear scientists have forecast a worthwhile contribution to the national electricity network by atomic power stations, at a cost comparable with that of coal-firing, possibly in 10 yr.

Some British scientists say the period may be even shorter, and point in evidence to the world's first atomic power station at Calder Hall in Cumberland, at present undergoing tests and due to operate in 18 months. A similar plant is under construction in the north of Scotland.

So much progress has been made with these projects recently, and so much knowledge gained about the suitability of the plants concerned, that a number of the 35 new power stations and of the 57 extensions to existing ones, planned by British

(*Continued on page* 57)

Output per man-shift has been on the increase



An important application for the new packaged power system should be in slusher service

Packaged Power

By R. G. GEHLSEN
Manager
Electrical Connector Products Division
Joy Manufacturing Co.

THE never ending battle to cut costs and increase safety in our nation's mines, has resulted in a "packaged" power distribution system for use in metal mining operations. An important application for such a system will be in slusher service.

Main components of the packaged power unit are: (1) the switch gear, which includes magnetic contractor with remote 125-v control lighting transformer and De-Ion breakers to provide cable short circuit protection and ground fault tripping; (2) cable; and (3) connectors.

Advantages of System

Several advantages are pointed out for a unitized distribution system of this type. It can be engineered to provide power to equipment in an economical manner. Sectionalized cable lengths mean correct footage in service and in turn, good voltage to a particular piece of equipment. Damaged cable can be repaired more easily and, because connectors are designed so that power is removed before they can be fully disengaged, there are no power arcs and the safety of mine personnel is increased.

Magnetic starters are available in several horsepower ratings with proper thermal overload heating elements. For slusher installation, a 125-v control circuit can be used for push button stations, an important safety feature when 440-v power is used at the slusher motor. This circuit provides remote control of starting equipment. A transformer is used for the control circuit. A lighting circuit can then be of any reasonable size required. An assembly of connectors, cord and flood lights is used to furnish light to suit requirements.

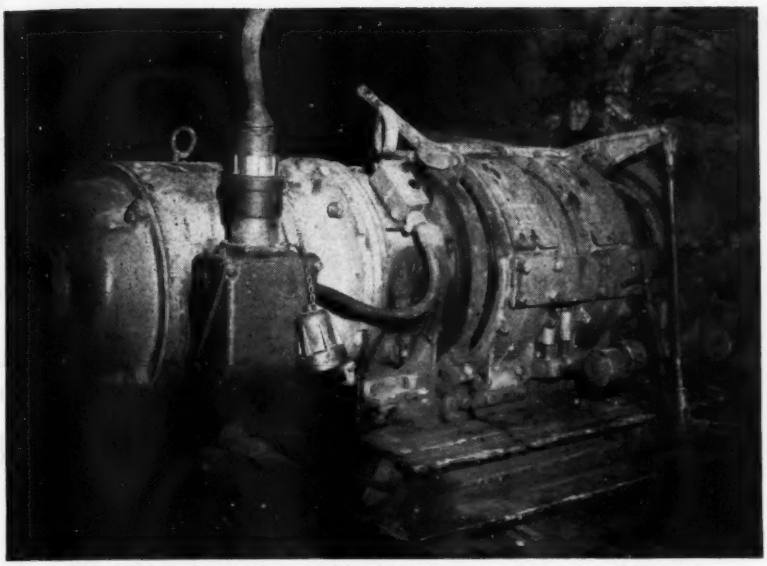
To switch power off and on, a De-Ion breaker is used in series with a magnetic starter. This provides short circuit protection in the event of cable damage. As an added feature, the De-Ion breaker can be furnished with a ground-fault trip. The dangers of shocks to personnel are minimized by such fault protection and, in the event of a short circuit in the system, power is cut off automatically and equipment is also protected from major damage.

Switch gear is housed in an aluminum casing and polarized connectors are conveniently located so that the entire assembly can be moved easily.

Sectionalized Cable

Many mine operating men might wonder about the value of sectionalizing electric slusher cable. The greatest advantage is that only the amount of electrical cable needed is used. This is important when one remembers that, in the case of ac power, ten percent voltage drop in the line results in a 19 percent loss in torque at the machine. The longer the cable the greater the line drop. Then too, why expose 700 ft of cable to the rigors of underground use where only 500 ft would do the job? Sectionalizing electric slusher cable into specified lengths, of say 100 or 150 ft, makes for easier transportation too. Simple electrical connectors on the ends of these standard lengths means that the

Connectors are designed so they are deenergized when opened, even if the power supply has not been cut off



The entire system has been designed to cut costs and to protect the miner

cables can be lengthened or shortened, as required, by any miner and eliminates the need to call in skilled electricians to do the job.

Another great value is realized when the cable is damaged, since only the damaged section need be replaced. The damaged section can then be sent outside and properly repaired. The need for "hurry-up" repair jobs disappears. The damaged pieces can be stored until a sufficient number have accumulated to warrant assigning a man to their repair; or cable repairs can be performed during slack periods in the electrical shop. Thus more efficient use can be made of electricians' time and a more effective cable maintenance program encouraged.

Selection of the cable is, of course, quite a topic in itself. All of the conductors can be located under one jacket in most installations. When this design is used, the slusher control push-button station must be located at or on the slusher itself. Under certain conditions it may be desirable to use two cables. When this is case the power conductors and the ground wire are carried in one cable, and the control cable in another. This allows the slusher operator to move his control point to a convenient location. A system like this is more flexible and convenient but it does increase maintenance and moving costs because two cables have to be handled rather than one.

Importance of Connectors

Connectors are an important part of the system. Every time a cable section is taken out or added to the system, someone has to disengage and engage a connector. Connectors used in this unit are designed for rugged service and have corrosion resistant, quick-locking couplings. Brass couplers serve to hold two connectors and/or cable ends together, and also to couple a portable connector to its mating, stationary receptacle such as is used for an outlet on the housing containing a magnetic contactor. The quick-locking connector couplings have two pins operating in a large open, square-shaped groove. As the pins on the coupling shell enter the groove, the short control pins are open-circuited while the power pins are already partially engaged with mating sockets. In this position the control circuit is open and no power can be transmitted. When the coupling is closed one-third of a turn, the pilot circuit begins to close. Then, with complete closing of the connector couplings, through three-quarters of a turn, the pilot pin is fully engaged. The unit is then ready for power transmission by operating the push button station.

Thus when disengaging the connectors, power is shut off before the connectors are fully disengaged; and conversely, when hooking up, connectors must be fully joined before power can flow. This feature complies with the U. S. Bureau of Mines specification that a connector must be deenergized upon opening.

Britain's Power Problem

(*Continued from page 55*)

Electricity Authority by the end of 1959 for coal-burning, may be atomic.

How vital this contribution will be, and how it will ease the problem of power-generation in the United Kingdom, may be gathered from the fact that coal for power stations accounts for around 17 percent of total British coal production. A low-grade type of small coal is required for this purpose, but the saving of even 1 percent of this, amounting to some 2,000,000 tons, would have been considered suitable occasion for national rejoicing in any year since the war.

There are still many problems to be overcome before atomic generation of power can become widespread in the U.K. Safety, and health and insurance factors have to be carefully evaluated before such plants can be put up in populous area. There is the question of disposal of radio-active by-products of such plants.

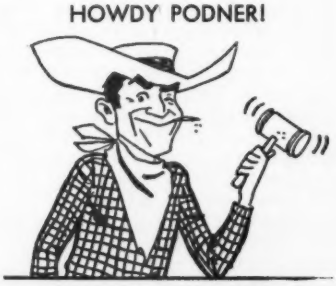
Nevertheless there is already good reason to suppose that nuclear power plants for the generation of electricity will be, providing the special precautions are observed, both safe and healthy.

But it should not be supposed that atomic energy used in this way will achieve a sudden transformation of the power supply situation in Britain.

Demand for electricity has doubled in 10 years; it may well double again in the next ten. It is thus probable that the advent of nuclear energy will mean not so much a switch of power stations from coal to the mighty atom (with a consequent saving of coal presently needed for this purpose), but an additional means of electricity generation for an increasing demand that could not otherwise be satisfied.

Atomic power, in fact, should be seen as vital adjunct to power provided from coal, not in general as a substitute for it. Britain will, in the foreseeable future, need as much coal as she can get and more than she is getting at present. This is not to minimize the importance of atomic energy, but rather to emphasize the need for the steps Britain has taken and is taking to develop still further her other power sources, coal and oil particularly, and to improve their efficiency.

HOWDY PODNER!



LAS VEGAS—OCTOBER 9-13

Wide diversity of mining service complicates the task of making uniform name plate ratings

Mining Machine Motor Identification

A Report of the Committee on Underground Power, Recommending that Standard Name Plate Ratings Be Adopted by Manufacturers of Motors for Mining Machines and Suggesting Certain Bases for Such Ratings

Submitted by
F. R. HUGUS, J. A. BUSS and E. L. PARKER

MOTORS on mining machines are designed to meet such special conditions that many manufacturers have felt justified in placing special terminology on the name plates rather than use established terms to convey the identity of the motor to the user. Such a practice leads to confusion and makes it quite difficult to select the proper capacity of the conversion and distribution equipment when machines with motors bearing such name plates are installed in mines. It is recommended that the mining industry consider the standards as ASA and NEMA which provide that motor name plates present the following information as a minimum:

D-C Motors:

(1) Manufacturers' type and frame designation.
(2) Horsepower Output.
(3) Kind of rating (time rating).
(4) Temperature rise at rated load.
(5) RPM at rated load.
(6) Voltage.
(7) Amperes at rated load.
(8) Type of winding (shunt, series, or compound).

A-C Motors:

(1) Manufacturers' type and frame designation.
(2) Horsepower output.
(3) Kind of rating (time rating).
(4) Temperature rise at rated load.
(5) RPM at rated load.
(6) Frequency.
(7) Number of phases.
(8) Voltage.
(9) Amperes at rated load.
(10) For general purpose motors, it is recomemnded that the service factor be marked on the name plate in addition to the rating.
(11) Code letter for inrush current.
(12) Design designation for torque characteristics.

Effect of Voltage Changes

Motor size usually is indicated by its horsepower rating. The electrical input into a D-C Motor can be expressed by multiplying volts impressed on the motor terminals by the amperes flowing in the motor leads, reducing to horsepower by dividing this produce by 746. Output can be expressed by multiplying revolutions per minute by torque in ft-lbs and reducing to horsepower by dividing the product by 5252. Torque is the push a rotating motor shaft will exert at a distance of one foot from the center of the shaft. The electrical input into the motor multiplied by the efficiency (to account for the losses in the motor) will equal the mechanical output for a d-c motor; this may be expressed by the following formula:

$$\frac{E \times I \times Eff.}{746}\ \text{(input)} = \frac{Rpm \times Ft\ Lb}{5252}\ \text{(output)}$$

Proper voltage at the face is an important requirement for modern mining. It is mine practice for motor-generator sets to have a light load output of 250 v rising to 275 v at full load. Mercury arc rectifiers usually have a grid control, which holds the voltage at a constant 275 v. With high generated voltages and the use of adequate feeder lines, voltages at the face in modern mines can be kept within 230

to 250 v with occasional increases to 275 v. This is better than was common only a few years ago when face voltages frequently dropped to the 150-175 range. Under actual mining conditions it is impossible to maintain name plate voltage at motor terminals all the time.

In general, if the voltage applied to a motor is varied, its speed and, therefore, its horsepower output will vary directly with the voltage and these changes will have an effect on the heating and the efficiency of the motor.

Changes in current, speed, horsepower, heating, and efficiency with changes in voltage are shown in fig. 1, 2, and 3 for a series wound, compound wound, and squirrel cage induction motor respectively. In order to have a common basis for comparison, the torque load on each motor is assumed to be held constant at the rated value produced by the motor when name plate voltage is impressed on it. Two curves are shown for motor temperature rise; one for a fan-cooled motor and one for a nonventilated motor. Actually, these curves represent two different motor designs, one with a cooling fan and one without.

The torque of an a-c motor varies directly as the square of the voltage. The series of curves in fig. 4 show that if the voltage impressed on a motor is reduced to about 60 or 70 percent of name plate voltage, the starting torque then will be less than that delivered at full load and rated voltage.

It should be noted that fig. 1, 2, 3, and 4 are typical operating curves for the general type of motor under consideration and the data presented in them should not be applied to a specific motor.

Motor Insulation

Motor insulation materials are selected for their electrical, physical and chemical properties and are combined in various ways for the motor power conductors. The electrical properties are primarily concerned with the dielectric strength or the ability to resist current flow when voltage is applied. The physical and chemical properties consist of mechanical strength, resistance to moisture, solvents, abrasions, and heat aging. These properties are important with respect to the stresses imposed by magnetic forces on the winding, the surrounding conditions under which the motor must operate and the operating temperature of the motor.

Insulation systems are divided into classes based on their heat aging characteristics. Experience has shown that certain insulating materials deteriorate rapidly above a certain operating temperature. The materials are, therefore, grouped in accordance with a maximum operating limit to give a reasonable long life under normal operating conditions. In general for every 8 to 10°C over the temperature limit, the life of the insulation will be cut in half. For example, a motor operating 20°C over the limit would have only ¼ normal life. Materials used in motor insulation systems are classified in three categories:

Class A materials consist of cotton, silk, paper and similar organic materials impregnated with natural or synthetic organic binders or varnishes.

Class B materials consist of mica, asbestos, fiberglass and similar inorganic materials with natural or synthetic organic binders or varnishes.

Class H materials consist of mica, asbestos, fiberglass and similar inorganic materials with binders or varnishes composed of silicone compounds or materials, with equivalent properties.

Class A insulation materials are most widely used because of lower costs and user preference for cooler machines in general. Classes B and H have the advantage of providing the designer more freedom in providing special motors particularly when space or weight are important factors. Motors with class H insulation, which allows maximum temperature rise, introduce some additional problems. Expansion, bearing and lubricant life must be given further study in the motor design. Surface temperatures on such motors may be high enough to require special precautions to prevent contact by operating personnel.

Temperature Measurement

The temperature limits assigned to the various classes of insulation for general purpose motors are shown in table I along with the various components which make up the total Hot Spot temperature. The temperature rise of a motor may be determined by the thermometer or the resistance method and a comparison between the two methods is shown in table II and table III.

Measurable temperature consists of the ambient temperature, or that of the surrounding air (or cooling water), plus the motor temperature rise. This rise is normally measured on the end turns of the winding or on the iron adjacent to the winding when using the thermometer method. It varies not only with the class of insulation but also with the type of enclosure and the method of measurement.

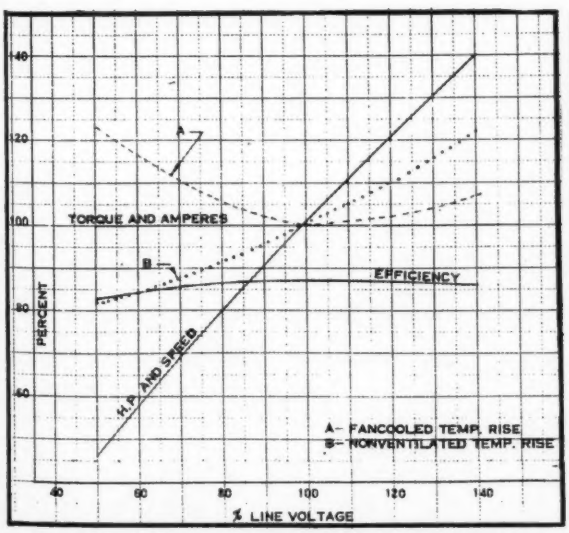


Fig. 1—Typical d-c series motor performance for constant torque-varying voltage operation

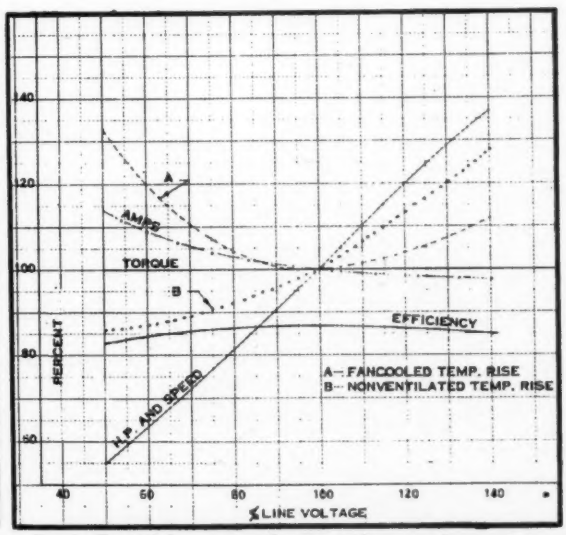


Fig. 2—Typical d-c compound motor performance for constant torque-varying voltage operation

Hot Spot allowance is a factor which relates the measurable temperature to the hottest spot in the motor. It varies with the type of insulation, the enclosure of the motor and the method of measurement. The type of insulation determines the heat transfer from the surface of the motor conductor to the outside surface of the insulation. The temperature gradient between these two points is higher with class B and class H materials. Hence, the increasing values of Hot Spot allowances from class A to class B to class H. The open motor which is cooled by air flowing directly over the ends of the winding has the greatest Hot Spot allowance to compensate for the greater cooling effect.

The general purpose motor is rated at 40°C rise and has a 10°C allowance for service factor. This factor is a mulplier indicating the permissible loading which may be applied over the rated output without shortening motor life. It was adopted primarily to provide a margin in the application of motors from stock or where uncertain loading conditions existed. It may also be used for actual loading where operating conditions are known.

The resistance method of measurement averages the end turn temperature with the other part of the winding to give a value closer to the hottest spot. Therefore, the allowance is reduced when using this method.

Motor designs are factory tested to assure that the temperature rise at name plate load does not exceed the name plate temperature limits. The factory tests and the methods of testing are defined and standardized in the test codes of National Electrical Manufacturers Association and the American Institute of Electrical Engineers. Factory tests may be made by either one or a combination of the three methods listed below. Frequently more than one method is used as a check on the results. The final choice of method is generally dependent upon the manufacturer's facilities for testing that particular style and size motor.

(1) ***By Thermometer.*** The temperature limits shown on the name plate are based on the temperatures measured by thermometer.

(2) ***By rise in resistance of the winding.***

(3) ***By means of embedded detectors or thermocouples installed in the winding during manufacture.*** This means is used frequently during a factory test to obtain data for design study as it provides the designer with an accurate picture of the temperature in many spots in the machine at any given time during the temperature tests.

It is generally not practical to perform the same type of heating tests in the field that the manufacturer made before the motor was shipped, however, it is sometimes possible to perform simple tests which will indicate whether the motor is exceeding its allowable temperature rise.

Temperature rise measurements may be by thermometer if there is access to allow the bulb of the thermometer to be placed in contact with the winding without disturbing the movement of ventilating air in or over the motor. The bulb should be attached by a small amount of putty in such a manner as to shield it from the surrounding air. The bulb must not be higher than any other part of the thermometer.

Direct reading portable pyrometer type temperature measuring devices are now available and provide the best means of determining temperatures of motors which have quickly removable handhole covers. Measurement of hot temperatures should be made only with the motor stationary and must be made within one minute after shutdown for dependable results. These readings need not be corrected for comparison with the name plate temperature limits.

If the resistance of the winding is one ohm or more, and facilities are available for measuring resistance, it is possible to calculate the temperature rise by a comparison of the resistance of the winding at room temperature before start-up with the resistance of the hot winding immediately after shutdown.

Methods of Cooling

Open-Type Motors and generators are cooled by flow of air over the heat producing areas of the windings. This may be room air drawn in through openings in the motor case by internal fans (such as open, drip proof, splash proof, and protected machines), or airpiped in from a cleaner and/or cooler space (known as a force ventilated, separately ventilated, or pipe ventilated machine). Occasionally separate external blowers are mounted on the motor to increase the flow of ventilating air.

Totally Enclosed Motors (U. S. B. M. explosion proof types) prevent the free exchange of air between the inside and outside of the case and are cooled by radiation from the outside surface. Since this is a very inefficient means of getting rid of the heat from the windings, machines of this type are normally larger for a given horsepower. The rate of radiation is improved and the motor made smaller by various combinations of internal circulation, internal and external ribbing of the motor case, and circulating air over the exterior of the motor by a fan or fans integral with the

TABLE I—TEMPERATURE LIMITS—THERMOMETER DEGREES CENTIGRADE

	Class A Insulation			Class B Insulation		Class H Insulation	
	General Purpose Open	Drip Proof	Totally Closed	Open	Totally Enclosed	Open	Totally Enclosed
Temp. Rise-Windings	40°	50°	55°	70°	75°	110°	115°
Hot Spot Allowance	15	15	10	20	15	30	25
Service Factor	10	—	—	—	—	—	—
Ambient Temp.	40	40	40	40	40	40	40
Total Temperature	105°	105°	105°	130°	130°	180°	180°

TABLE II—A-C MOTORS—TEMPERATURE RISE °C IN WINDINGS

	Class A Insulation				Class B Insulation			Class H Insulation		
Method of Measurement	General Purpose Open	Drip Proof	Tot. Encl. Non-Vent.	Tot. Encl. Fan Cool.	Open	Tot. Encl. Non-Vent.	Tot. Encl. Fan Cool.	Open	Tot. Encl. Non-Vent.	Tot. Encl. Fan Cool.
Thermometer	40°	50°	55°	55°	70°	75°	75°	110°	115°	115°
Resistance	50°	60°	65°	60°	80°	85°	80°	125°	130°	125°

TABLE III—D-C MOTORS—TEMPERATURE RISE °C IN ARMATURE WINDINGS

	Class A Insulation			Class B Insulation		Class H Insulation	
Method of Measurement	General Purpose Open	Drip Proof	Totally Enclosed	Open	Totally Enclosed	Open	Totally Enclosed
Thermometer	40°	50°	55°	70°	75°	110°	115°
Resistance	—	70°	70°	100°	100°	155°	155°

machine but external to the motor case.

Water-Cooled Motors have circulating water through the motor case or pipes in intimate contact with the case.

Consideration of these methods of cooling, plus the fact that the motor manufacturers employ numerous variations of each method to reach the best results for the application for which the motor is designed, makes it obvious that a true indication of motor temperature cannot be obtained by measurement of the temperature of the outside of the motor case, the exhaust ventilating air, or outlet cooling water.

Basis of Motor Rating

National Electrical Manufacturers Association Standards define a motor rating as, "The rating of a machine shall consist of the output together with any other characteristics, such as speed, voltage and current, assigned to it by the manufacturer." It should be understood that the nameplate output of the motor in horsepower is meaningless unless it is tied to a duty designation. Standard duty designations are: (a) Continuous, (b) 5 minutes, (c) 15 minutes, (d) 30 minutes, and (e) 60 minutes.

When the nameplate reads "Continuous" duty, it means that the motor may be operated continuously at the nameplate horsepower without exceeding the temperature rise indicated on the nameplate. Likewise a 60-minute duty means that the motor (starting at room temperature) may be operated steadily at the nameplate horsepower for 60 minutes without exceeding the nameplate temperature rise. It is seldom that the demands of an application require the motor to be operated exactly at its nameplate rating. For this reason, the application engineer calculates an equivalent continuous or short time duty and then selects the proper design to fit the application.

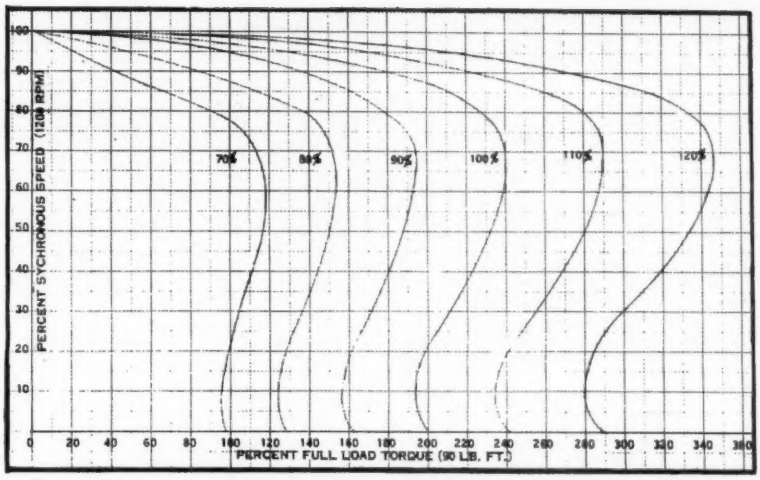


Fig. 3—Typical a-c squirrel cage motor performance for constant torque-varying voltage operation

Information necessary to calculate the suitability of a motor design for a given application is not readily available to the user in the mine; however, a ready check is available if the temperature rise of the motor is periodically measured under actual operating conditions. Comparison of the actual operating temperature rise and the nameplate limit will immediately show if the motor is overloaded, and thus subject to a reduced life expectancy. When comparisons of operating and nameplate temperatures are made, it is important to remember that the name plate shows temperature measurements expressed in degrees Centigrade.

Since the ambient temperature in practically all mines is 20°C, which is ½ of the 40°C ambient temperature used by general industry, this cooler temperature is sometimes recognized when motors are applied to mining machines. This encourages the mining machine designer to apply motors on the basis of total temperature rather than on the basis of an ambient temperature plus a temperature rise. More horsepower can be put in a given space.

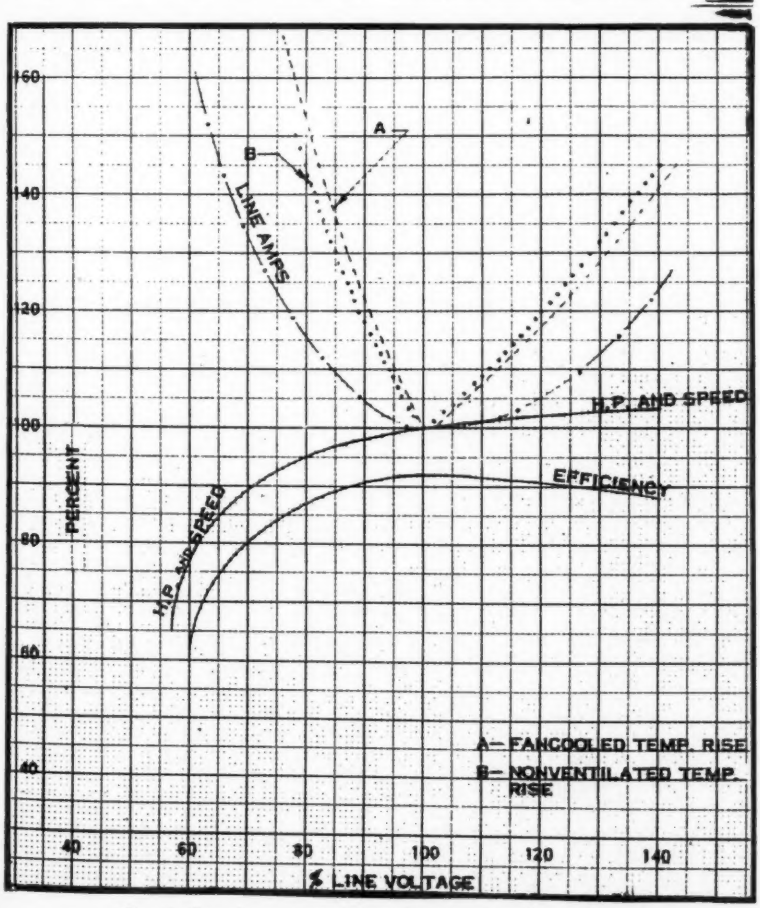


Fig. 4—Speed torque variations for percent voltage change

Editor's Note: The foregoing is Part I of the Committee report on mining machine motors. Part II—"Mining Machine Motor Characteristics" will be published in an early issue.

Operating Problems at Yerington

Many mines lack sufficient water; at Weed Heights the reverse is true

How Water and Difficult Grade Control Problems Were Met and Solved at Nevada Open Pit Copper Mine

By H. R. BURCH
Mine Superintendent
Yerington Mine
Anaconda Copper Mining Co.

THE Yerington Mine at Weed Heights, Nev. is not a great deal different from operations at many other open pit properties. For that reason it is not intended here to discuss operational features such as shovel loading, trucking, blasting etc.

There are however, several unusual problems and it is with these in mind that this article has been prepared. The first is the matter of ground water in the open pit; the second is the very close control which must be applied to this open pit, especially in selective mining to obtain the desired average grade of ore. The third point which will be covered is a brief description of operations at the Leviathan Mine, a sulphur property located in Alpine County, Calif., about 58 miles by road from the mine at Weed Heights.

Too Much Water

At most properties the problem is usually how to obtain sufficient water to satisfy demands for both domestic and industrial use. Quite the reverse is true at Weed Heights. From exploration work carried on in previous years, it was found that there was a heavy flow of water from some underground source and that this would constitute a serious problem in open pit mining. Absolutely no information was available as to the direction of flow underground, although some brief data were available as to a possible quantity namely about 1500 gpm. The first problem, then, was to try to determine the direction of flow and location of this underground water. For this purpose test wells of small diameter were drilled around the outside surface limits of the pit. By test pumping these holes it was possible to determine more or less what flow could be expected in the different areas and also what effect any one particular hole might have in lowering the static water level in other holes.

From the above information a program was outlined from which five wells were located strategically close to, but outside of the active pit area. Inasmuch as time was limited, these holes were not drilled as deep as desired, but they did serve the immediate purpose of furnishing a water supply for domestic use in townsite and also for industrial use in the mine, shops, and in the metallurgical plant. Detailed data were kept on these wells and by using this information the steps necessary to complete the over-all picture were determined.

It must be remembered that there were two objectives in drilling wells, —firstly, to obtain water for use in our work, and secondly, but of equal importance, wells had to be placed in such locations that the existing water level inside the pit area proper might be lowered well in advance of the opening up of each successive bench.

At the present time, the static level in the pit proper has been lowered some 90 ft, and the present water elevation is about 10 ft below the lowest bench opened.

The final program, already well along, is to drill certain holes to a depth of approximately 100 ft below the bottom of ore in the pit. These wells have been located so that by increasing the pumping rate in any one, or all, of these deep wells flow of water underground can be held back from the pit area proper, thus lowering the water level inside the pit area so that there should be no trouble in lower bench operations.

Grade Control Important

Although the Yerington Mine orebody was discovered about 1870 only an estimated 100,000 tons of ore had been removed in 1942 when the property was acquired by Anaconda Copper Mining Co. An extensive pros-

pecting program begun then was completed in 1945.

A 400-ft shaft was sunk and laterals were driven from it on two levels. This underground work was correlated with diamond drill and churn drill holes from the surface. From the information obtained, the orebody was blocked out and estimates of the tonnage were made.

Ore Not Uniform

The Yerington Mine orebody is far from uniform in grade and a very strict control must be maintained at all times. This entails a lot of additional mapping and assaying to determine copper content and to deliver the required average grade to the plant. It was found necessary to augment the original prospect drilling by considerable work in the active areas, drilling holes 100 to 150 ft deep on 100-ft centers to give a more complete picture, not only for immediate operations, but for those scheduled within 12 months' time. The ore occurs in very much smaller masses than is generally the case in porphyry copper deposits. A strong effort is being made to outline this work and correlate it with the opening up of new benches. It is hoped that through this program the depth of holes can be decreased and the necessity of having to build roads for moving churn drills to the desired locations will be avoided. Both churn drills and a Joy rotary drill are used. However, at present practically all of this prospect work is done by churn drill. Water interferes with the rotary drill, and as explained previously, water is one of our great problems.

Originally, mining was begun on 50-ft vertical benches, but this was changed immediately to 25-ft benches to facilitate segregation of ore and waste and to permit selective mining. It has been found absolutely essential to carry out selective mining shift by shift. Also use of 25-ft benches in the type of ground such as exists at Yerington makes it possible to maintain good shovel efficiency. The shovels are able to clean this height of face without any danger of the bank hanging up.

Because of the close control required in mining a detailed mining plan is prepared daily. The shift foreman is provided with a schedule for each shovel and a map of each working bench daily. The maps show grades for each prospect and blast hole, and are marked to show the exact location in which each shovel will work. Alternate locations are shown for all shovels so that, in case of breakdown, the shift foreman can move from one shovel to another and still maintain the required grade to the plant. By careful observance of these mining plans it has been possible to control closely the grade of ore and other material mined. Because of the extreme variations in grade, it is often necessary to use two or more shovels in ore on one shift. High grade ore is limited in extent and its mining must be carefully scheduled. Sometimes as little as a one-hr run of high grade is mixed with seven hours' output of lower grade.

Toes are surveyed on all working benches twice daily and the information transferred to the mining plan. This is done to make sure that the shovels not only were scheduled properly but actually worked in their scheduled locations. If any variation of position of shovels has caused a variation of grade, changes in schedule of succeeding shifts can be made to adjust the grade to its proper level.

All blast holes are located in the field by the Engineering Department so that proper calculation can be made of the material to be mined. Since blast holes are on about 22-ft centers and prospect holes are on 100-ft centers, there is enough information to calculate closely the copper content of the material concerned. It is often necessary to sort low grade material from the benches before mining the ore. Here again, the 25-ft height of the benches is an advantage.

Assay Blasthole Cuttings

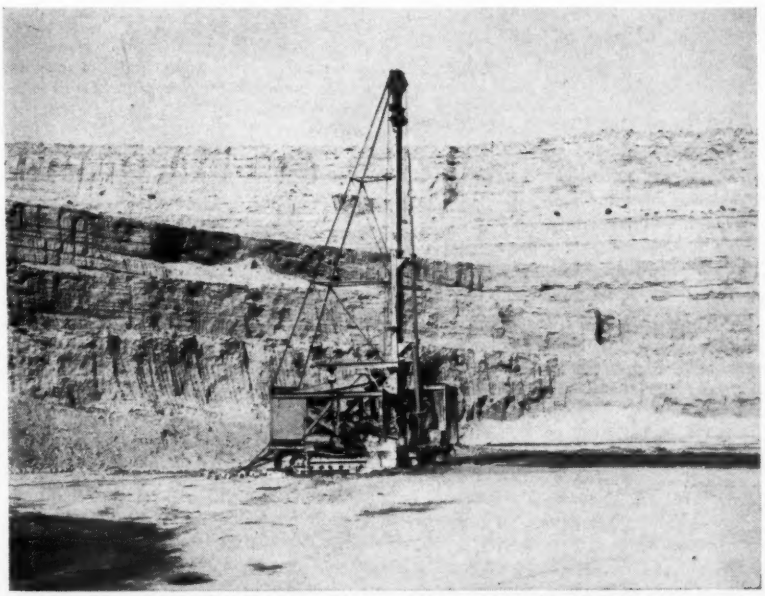
All blast holes are drilled with a Joy, Model 58 B-H, electrically operated. This machine is equipped with a rotoclone in which an automatic sampling device has been installed. Extensive tests were carried out to determine the accuracy of the automatic sampler. By collecting all the rejects from many rotary drill holes and passing this material through Jones splitters, it is possible to compare the results obtained with the values derived by the automatic sampler. It was discovered that the assays differed by about .10 per cent copper.

When the Joy drill is operating, some fine dust is exhausted through the stack from the Rotoclone. To determine the amount of this dust and its copper content the Rotoclone exhausts through a filter box. The dust collected was weighed, as well as the other cuttings, to determine the percentage of dust exhausted. It was found that the dust amounted to less than 2 per cent of the total material extracted from the hole.

When weighted assays were made using the dust as well as the other material from the hole, it was found that the difference obtained by assaying the dust and including it with the coarser material amounted to slightly less than .003 per cent of copper. Although the dust exhausted by the Rotoclone is generally of somewhat higher grade than the coarser particles, the percentage of dust is so small that assays based only on the coarser particles are entirely satisfactory for even closest ore control.

By continuing an adequate prospect drilling program to be used in conjunction with information obtained from blast hole drilling and by close and careful scheduling and operation of shovels, it is possible to mine this very erratic orebody with success.

Whether this same difficult problem will continue through the entire life of the pit cannot be predicted at this time, however, if it does exist, the problem will be met and overcome. But we certainly hope that it may not be as major as at present.



Original prospect drilling must be augmented with considerable work in active areas

Mine Sulphur Ore

The Leviathan Sulphur Mine in Alpine County, Calif. is 58 miles from the Yerington Mine at Weed Heights, Nev. The low grade ore there is made up of elemental sulphur impregnated in volcanic rock. The average grade is about 28 per cent.

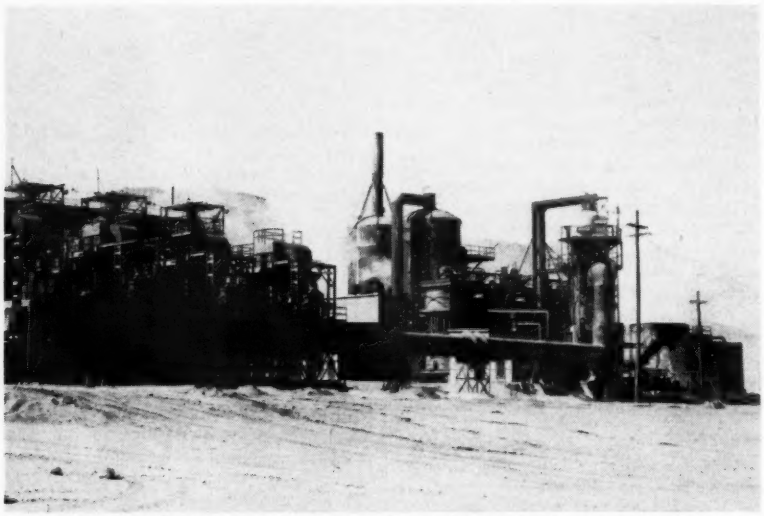
Sulphur ore mined is treated in the FluoSolids plant at Weed Heights to provide SO_2 gas from which sulphuric acid is made in the contact acid plant. The acid is used in leaching the oxide copper ore mined at Yerington.

Sulphur-bearing rock was found to exist for a depth of approximately 100 ft at a point about 300 ft below the surface. At first, underground mining was considered; but it was decided that open pit methods would be more economical even with a high waste to ore ratio of 10 to 1. Although open pit methods would necessarily completely eliminate danger of fire, it could be better controlled. In other words, a fire in the open could be handled and brought under control whereas fire underground in sulphur material might never be controlled. This has proved true in practice, as quite a number of problems have arisen even in mining this material by open pit methods. In the first place, the sulphur dust itself can be very annoying and aggravating, and full protective measures are taken. Workmen are furnished goggles etc. to prevent irritation, especially to the eyes. There have been several instances of fires and the method of handling them is discussed a little later.

Inasmuch as small open pit equipment will be used for mining, the height of benches will be limited to 15 ft. This height also permits greater selectivity in ore grade. This sulphur orebody is not a continuous blanket of a fixed quality. The percent of elemental sulphur varies considerably from point to point.

Since all blasthole drilling is done with a Joy Model 225 drill, equipped with a Rotoclone and an automatic sampler, and since the blastholes are on about 10-ft centers, a good record as to the grade of the material to be mined is always available.

By continuously watching the blasthole drill assays and by observation of the working faces, it has been possible to mine this ore with very little dilution. Fortunately there is often a decided difference in color between the sulphur ore and the more barren material which makes segregation more simple. Frequently on the benches it is possible to strip several feet of barren material from the top of the ore by bulldozer before loading the ore in trucks to be hauled to the crusher.



Yerington FluoSolids and acid plant is fed sulphur ore from company's Leviathan mine in Alpine Co., Calif.

Crush and Screen at Mine

A jaw crusher and screening plant has been installed at Leviathan in order to provide a product suitable for easy transportation by truck for the 58-mile haul to the FluoSolids and Acid Plant. This crushing plant is so arranged that the minus four-in. material is by-passed through a grizzly ahead of the crusher and passed over a double deck screen. The plus ⅛-in. material is returned to the belt under the crusher and the minus ⅛-in. fraction is diverted to a separate belt. Since it is found that a good part of the minus ⅛-in. rock is of much lower grade than the plus ⅛-in. ore, the minus ⅛ material is rejected and the grade of the ore shipped is raised. Frequently 10 per cent of the material sent to the crusher can be wasted, thereby raising grade and saving transportation costs.

Fire Fighting

This sulphur ore can be ignited with a match and burns at a low temperature. Fires have been started by blasting, also due to friction. Spontaneous combustion has occurred where high pyrites have been involved, and fire has broken out both in ore on the benches and in ore placed in stockpiles. In stockpiling this material fires have been started by the friction of rock rolling on top of rock. For that reason stockpiling is not carried out by the usual method of dumping a truck over the edge. Instead the material is laid down in layers or blankets and compacted, and by sealing off any air passages which would permit air drafts. Water has been useless in putting out fires started on the benches or in the stockpiles and the only effective means is by compacting fires over the area and smothering.

The tremendous stripping job at Leviathan in order to uncover the sulphur ore body was contracted to Isbell Construction Co., and the actual work has been carried out under our own supervision. Mining of the sulphur ore is being carried out by Anaconda personnel, and it is necessary to mine in seven months sufficient ore to satisfy a year's requirements. The daily tonnage over that currently required is stockpiled at Weed Heights for use during the winter. It has been found impractical to operate the sulphur mine during the heavy snow months of winter.

It is interesting to note that it has been possible to raise the grade of sulphur considerably by screening as described previously. This is not a hard and fast rule, however, and proper procedure must be determined from day to day. In some instances removal of the fines does raise the grade, whereas in other instances, the fines are just as high a grade as the rock itself.

Quick Assay Method

It requires considerable time to make assays of sulphur ore by the accurate barium sulphate method, and for that reason our chemist, Mr. Stewart, offered a simple procedure, which although not as accurate as the barium sulphate method serves our purpose very well and is quite rapid. The sulphur ore is crushed, pulverized and then dried. After drying, a weighed amount of ore is placed in a gas fired furnace where the sulphur is burned. By reweighing the sample after burning the percent of sulphur is determined. This entire operation is carried out in about two hr. and by its use greater control of ore mined is obtained.

Bit cost reduced 51 percent at Peters Creek Coal Company using Kennametal* D-3-inch Bits

High in the mountains of southern West Virginia, the Peters Creek Coal Company is maintaining a shift average of a brisk 21-ton per man mining out fingers of its Eagle Seam using Kennametal D-3-inch Bits.

In this seam, mining is normally limited to the 28-38 inches of coal sandwiched between two bone bands. This coal is exceedingly difficult to cut and drill, and face preparation requires major attention.

Kennametal Bits are used by the Peters Creek Coal Company as a result of drilling tests made several years ago as a part of a modernization program to increase production. For a two-month period, conventional steel and Kennametal D-3-inch Bits were tested. Accurate bit cost records proved that, during that period, the cost of conventional steel bits was $187.00. The cost of the Kennametal Bits was $92.50 . . . a saving of over 50 percent.

You learn to expect this type of performance when you use Kennametal. When next you buy, be sure to specify these quality, sintered carbide bits. They'll cost you less in the long run. Write to KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

*Registered Trademark

The best measure of tool performance is bit cost per ton of coal

Peters Creek Coal Company, like other practical mine operators, has found that there is only one measure of mining tool performance . . . that is, *bit cost per ton.*

Why not let your Kennametal Mine Service Representative demonstrate Kennametal's ability to help you hold bit cost down to a minimum by showing you actual performance records? You will find not only that Kennametal Bits last longer, make drilling easier, improve rates of penetration, and increase coal production, but also that Kennametal Bits need reconditioning less often and cause little strain on equipment.

These records are due to one factor . . . Kennametal is the only sintered carbide producer that owns complete facilities for production of tungsten carbide tools, from raw materials to finished product . . . and so is able to maintain rigid quality control throughout every stage of production from mining select ores through complex phases of refining and manufacturing. The end result is less bit cost per ton of coal mined.

8835

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress

DRILL BITS

ROOF BITS

MACHINE BITS

ROCK BITS

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

CONGRESS continues to receive legislative proposals from the President covering various facets of the Administration's program of "dynamic conservatism," and committees of both Houses are increasingly active, holding hearings on bills covering matters ranging from Alaska-Hawaii statehood to strengthening of the armed forces reserves.

House Approves Trade Act

On February 18 the House passed and sent to the Senate, by a vote of 295 to 110, an Administration-sponsored bill to extend the President's authority to enter into trade agreements for a period of three years, to June 30, 1958. The measure, which would give the President general power to cut tariffs up to 15 percent over the next three years, was highly controversial, and passed only after a stormy session in which a motion for its recommittal was narrowly defeated by a vote of 206 to 199.

During earlier House Ways and Means Committee hearings, representatives of industries opposed to extension of the Act presented strong testimony in support of their position.

The American Mining Congress, in a statement to the Committee, declared that Congress must promptly develop a sound long-range tariff policy for mineral resources essential to our defense. Amplifying the Declaration of Policy adopted at San Francisco last September, recommendations were made as to (1) escape clause, (2) peril point, (3) excise tax on lead and zinc, (4) import quota on residual oil, and (5) strategic and critical minerals.

It was pointed out that the original intent of the escape clause, to prevent serious injury to domestic producers and workers, has been practically nullified through Executive disregard of Tariff Commission recommendations. It was urged that the authority for approving or disapproving the recommendations of the Tariff Commission be removed from the Executive Department and returned to Congress, where the authority to fix tariffs is lodged by the Constitution—and that such action will serve to insure proper consideration for domestic producers throughout the process of adjusting tariff rates.

As to the peril point provisions, also the Mining Congress recommended that final responsibility for passing on the Tariff Commission's recommendations be placed in the hands of Congress.

Pointing to excessive imports of lead and zinc, the Committee was urged to provide for an adequate excise tax on these minerals, to be suspended whenever market prices are at an economic level that will permit the domestic industry to maintain an adequate "mobilization base" for national security. It was recognized that the President's broadened stockpiling program has afforded some temporary relief, but it was made clear that it has not resulted in the reopening of closed lead-zinc mines nor the reemployment of idle workers; and that so long as Government policy with respect to the domestic lead-zinc industry is based solely on a temporary short-range program, it will be difficult for lead-zinc producers to make the necessary expenditures to extend known deposits and develop new ore reserves.

The Committee was told that the American Mining Congress is deeply concerned over the harm being done to the coal industry by excessive imports of residual fuel oil. The impact of such imports on the domestic economy, including not only the coal industry and coal mine workers but also on the domestic oil industry and the railroads, was brought out. Declaring that this nation can ill-afford to ignore the vital role coal plays in the mobilization base for national defense, the Mining Congress recommended that Congress establish an over-all quota of 10 percent of domestic consumption on imports of foreign residual fuel oil.

★ ★ ★ ★ ★ ★ ★

Washington Highlights

TRADE ACT: Passes House
FUELS POLICY: Report Released
TAXES: Battle Under Way
LEAD-ZINC AID: Congress Group Formed
COAL WAGES: Minimum Sought
TAFT-HARTLEY ACT: AFL Seeks Change

★ ★ ★ ★ ★ ★ ★

The Committee was also asked to establish a policy in the pending legislation under which duties on strategic and critical minerals will be restored to at least the statutory rates of duty under the 1930 Tariff Act. In conclusion, the Mining Congress pointed out that a healthy, going mining industry is the essential foundation upon which our Government must erect its mobilization base.

Fuels Policy

After almost seven months since its creation, the Cabinet Committee on Energy Supplies and Resources has finally come up with recommendations for a national fuels policy. The Committee's report to the President was made public by the White House on February 26. While it is sprinkled through with specific recommendations designed to maintain a strong mobilization base for the coal, oil and natural gas industries, it leaves many problems of the coal industry to be resolved at an indefinite later date.

In the field of natural gas regulation the Committee would leave control of the production and conservation of natural gas to the States, control of interstate transmission of gas to the Federal Power Commission, and control of gas distribution to the local public utility commissions. The report did call for the Federal Power Commission, when considering certifications of new gas lines, or in-

creased rates, to give consideration to the surety of supply, and to whether contract prices are reached competitively and represent "the reasonable market field price." It called for "appropriate action" to prohibit sales by interstate pipelines which drive out competing fuels because the sales are below actual costs plus a fair proportion of fixed charges.

The Committee report also recommended that the power of eminent domain be granted for the acquisition of surface and mineral rights for the development of underground gas storage reservoirs subject to "appropriate safeguards to protect the public safety, including the mining industry."

On the highly controversial problem of limiting oil imports, the Committee failed to spell out a clear cut policy. Rather, it said that importation of crude and residual oils should not exceed "significantly" the respective proportions that these imports bore to the *production of domestic crude oil in 1954*. The report was emphatic in stating that this balance should be achieved by voluntary action of the importers and that every effort would be made to avoid governmental intervention. In the event that imports exceed significantly the 1954 balance between imports and domestic crude oil output, the Committee said "appropriate action should be taken," but it failed to indicate what form or what agency should take this action. It was also urged that the Departments of Defense and Interior conduct studies to determine the adequacy of present and prospective refinery capacity to meet defense needs.

Turning to tax incentives, the Committee recommended: (1) continuing Government analysis and study of tax provisions on coal, oil and gas production with a view to recommending changes that will continue development of domestic resources, provided these fall within the fiscal and tax policies of the Government, (2) avoidance of retroactive tax legislation and special relief provisions, and (3) limiting accelerated amortization to insuring the maintenance of a sound mobilization base.

To aid the coal industry in achieving more "vitality as an instrument of national defense," the Committee urged (1) a Federal-State-coal industry study to determine what research and development could be undertaken, (2) continuation of the Interdepartmental Committee on the Soft Coal Industry to develop, for Cabinet consideration, programs aimed at relieving unemployment and business distress in the industry, (3) voluntary action by the railroads, or, in its absence, compulsory action by the ICC to reduce coal freight rates and charges, (4) Government assistance to increase U. S. coal exports and to secure removal of discriminatory restrictions of foreign nations on coal imports, (5) ODM to undertake a study to bring about expansion of coke production to meet defense requirements, and (6) adoption of a fuel purchasing policy which would require the Federal Government "to the extent practicable" to secure not less than 75 percent of its annual coal requirements on a contract basis, with the contracts carrying escalator clauses to protect the buyer and seller.

The fuels purchasing policy also had these important additional facets: the Secretary of Labor should establish coal wage standards under the Walsh-Healey Act as soon as possible; all Government coal suppliers, regardless of size, should comply with the Federal Coal Mine Safety Act; and all Government purchases of coal should be made a matter of public information.

The recommendations are subject to approval by President Eisenhower before they may be placed into effect.

Taxes

On February 25 the House approved, 242 to 175, a bill extending for another year the 52 percent corporate income tax rate, together with present excise tax rates on liquor, gasoline, automobiles, and cigarettes. The Administration had strongly urged extension of the existing taxes, which under present law would drop to lower rates effective April 1.

The majority members added to this legislation a highly-controversial provision allowing an individual income tax credit of $20 for each taxpayer and each dependent beginning January 1, 1956. This tax credit, on a full-year basis, would largely offset the increased revenues from extension of the present corporate and excise tax rates.

The President denounced at a press conference the individual tax cut as reaching "some kind of heights in fiscal irresponsibility." He reiterated his hope that if all goes well with the Administration's economic and budget-cutting program, taxes can be reduced in 1956.

The Senate was expected to consider the bill in the near future, with opponents of the individual tax cut waging an all-out battle to delete that section of the measure.

Lead-Zinc Aid Group

Twenty-three Congressmen have formed a bipartisan committee to explore remedies for relief of distressed conditions in the lead-zinc mining industry. Rep. Dawson (Rep., Utah), chairman of the group, has announced that he is arranging a series of conferences at the White House as the Committee's first move.

Dawson said the President's lead-zinc stockpiling program to bolster depressed markets has failed in its objective, and that domestic producers will not be able to meet foreign competition without additional tariff protection. He indicated that the committee would push for a plan to tie the lead-zinc industry into a defense program that would keep the mines in at least a standby condition.

In addition to Dawson, other members of the committee are:

Democrats — Reps. Udall (Ariz.), Engle (Calif.), Aspinall and Rogers (Colo.), Pfost (Idaho), Metcalf (Mont.), Edmondson (Okla.), Dempsey and Fernandez (N. M.), and Rogers (Tex.).

Republicans—Reps. Rhodes (Ariz.), Chenoweth and Hill (Colo.), Budge (Idaho), Allen (Ill.), Fjare (Mont.), Miller (Nebr.), Young (Nev.), Simpson (Pa.), Withrow (Wis.), Thomson (Wyo.), and Dixon (Utah).

Coal Minimum Wage

Examiner Grant of the Wage and Hour Division of the Labor Department has been holding hearings intermittently since February 1 on a petition requesting the determination of a prevailing wage for the bituminous coal industry under the Walsh-Healey Act.

Petitioners for the prevailing wage determination are the United Mine Workers, Pittsburgh Consolidation Coal Co., and Pocahontas Fuel Co.

These organizations and others presented detailed testimony supporting the request for a wage determination, while spokesmen for nonunion mine operators opposed such a determination.

Witnesses in behalf of the petitioners included John L. Lewis, UMW president; Hugh Hawthorne, Pocahontas Fuel Co.; and George A. Lamb, manager of Business Surveys, Pittsburgh Consolidation Coal Co.

Compulsory Unionism

The American Federation of Labor has called for "immediate" repeal of a Taft-Hartley Act provision that permits states to outlaw compulsory unionism, saying that "this is the big issue before Congress." The AFL's executive council said the nation's "future economic security depends on nullifying the 17 State right-to-work laws that prohibit labor-management contracts making union membership a condition of employment. The right of states to enact such laws, it said, "has opened the door for an organized drive by big business to destroy union security and union standards through piecemeal legislative attacks in the various states."

Meanwhile, creation of the "National Right to Work Committee" was recently announced by E. S. Dillard, chairman of the organization and president of Old Dominion Box Co., Charlotte, N. C. Its purpose is "to establish . . . the principle that Americans must have the right, but not be compelled, to join labor unions."

Ralph E. Kirk and **Percy G. Cowin** have announced their association as consulting registered professional engineers in the mineral industries. Known as Kirk and Cowin, the firm has offices at Number One 18th Street, S. W., Birmingham, Ala.

Kirk recently retired as manager of raw materials for the Tennessee Coal and Iron Division of United States Steel Corp.

Frank A. Ayer, New York consulting engineer and a pioneer in the reopening of the White Pine Mine in northern Michigan, has recently returned from a 26,000-mile trip to Europe and Africa. In the course of his trip Ayer visited the copper mines in Cyprus and Northern Rhodesia as well as the gold mines on the Rand in the Union of South Africa.

Joseph Kennedy has been selected by newly-elected Pennsylvania Governor George M. Leader to fill the State cabinet post of Secretary of Mines. He succeeds **W. J. Clements** in that position. Kennedy has been affiliated with United Mine Workers of America for 25 years and was executive assistant to the international vice-president at the time of his appointment.

The Mining Association of Montana has elected **Fred E. Burnet** president to succeed **Ted E. Collins.** Burnet is operating superintendent of Montana Phosphate Products Co. at Garrison, Mont. He was formerly employed at the Trail and Kimberley, B. C., operations of Consolidated Mining and Smelting Co. of Canada.

Hubert A. Cassell, Sr., a veteran of 47 years in the coal mines, has been appointed division superintendent for Pocahontas Fuel Co. Leaving the company's Itmann Mine as superintendent, he will be succeeded in that position by **Grover L. Asbury,** who has been assistant superintendent since December 1, 1954. **Michael M. O'Brien** has been appointed assistant superintendent to succeed Asbury.

In his new position Mr. Cassell will have charge of supervision and planning for the Amonate, Bishop, and Itmann mines of the company.

Utah Mining Association's officers for 1955 are: **Otto Herres,** vice-president, Combined Metals Reduction Co., president; **L. F. Pett,** general manager, Kennecott Copper Corp., Utah Mines Div., first vice-president; **Clark L. Wilson,** vice-president and manager of operations, New Park Mining Co., second vice-president. Reappointed were **A. G. MacKenzie,** vice-president and consultant; **Miles P. Romney,** secretary-manager and **Walter M. Horne,** assistant secretary-manager.

E. B. Leisenring, Jr., has been named an assistant vice-president of Westmoreland Coal Co. and assistant to the president of Stonega Coke and Coal Co.

John A. Reeves, chief engineer at Kenilworth, Utah, for Independent Coal & Coke Co., has resigned to become mining engineer at the Soda Springs, Idaho, phosphate operation of Monsanto Chemical Co.

C. Kremer Bain has retired as consulting engineer for St. Joseph Lead Co. to enter private consulting practice. For many of his 34 years with St. Joe, in the United States and abroad, Bain was in charge of mining, milling, prospecting and administrative work of the northern division, with headquarters in Bonne Terre, Mo.

He took an active part in developing the company's mechanization program and development of safe, economical mining methods. It was Bain who originated the practice of roof bolting, which has become so widely used in all branches of the industry in recent years and he holds patents on a completely mechanized shaft sinking method.

Since March 1, his address has been 410 North Newstead Ave., St. Louis, Mo.

Virgil O. McCollum has been named industrial relations director of the United States Potash Co. at Carlsbad, N. M. He succeeds **Hollister Jones,** who retired after holding that job since 1942. McCullum joined USP in 1932 in the refinery office.

After 44 years of service, **Oscar H. Johnson** has retired from his position as chairman of the Board of Directors of The Mine and Smelter Supply Co. of Denver, Colo.

Johnson will continue to have his business address at the company offices in Denver, so the many friends he has made during his long career can contact him readily.

William E. Connor has been appointed manager of electric utility sales for the Middle Atlantic sales region of Federal Pacific Electric Co., Newark, N. J. Before joining The Federal Pacific organization, Connor was associated with the Lehigh Navigation Coal Co., Lansford, Pa., where for the last seven years he had been mechanical superintendent.

Alan Probert has resigned from the U. S. Bureau of Mines to accept a position as vice-president and general manager of the Compania Minera de Guatemala S.A., producers of lead, zinc and silver ores and concentrates. His new address is Box 511, Apartado Postal, Guatemala, Guatemala, C. A.

Upon his departure from the Bureau, Probert was awarded the Department of the Interior's silver medal for Meritorious Service.

New executive assignments have been announced by the Island Creek Coal Co. **Russell W. Laxson,** formerly vice-president and comptroller, has been appointed administrative vice-president in Huntington, W. Va. His new duties include responsibility for all day-to-day business activities in the Huntington headquarters.

James L. Hamilton, vice-president of operations, continues in that capacity in charge of mining operations for Island Creek and its affiliate, Pond Creek Pocahontas Co. He continue to maintain his headquarters at Holden.

A. L. Lynn, formerly vice-president of merchandising, has been named vice-president of planning and development. **William C. Nelson,** formerly assistant to the president, has been made vice-president of production planning.

According to an announcement made by Charles R. Cox, president, the board of directors of Kennecott Copper Corp., has appointed **James Boyd** vice - president — exploration to succeed **Anton Gray**, who recently resigned to ill health.

James Boyd

Boyd has served as manager of the corporation's exploration department since joining Kennecott in October 1951. Prior to that, he held the position of Director of the U. S. Bureau of Mines for almost five years. The new vice-president heads an organization that is conducting exploration activities in the United States and Canada and elsewhere throughout the free world.

At the first of the year, **John F. Dugan**, general superintendent of mines for International Smelting & Refining Co., retired. Dugan will remain in Salt Lake City, however, as a consultant for the company. A native of Butte, Mont., and a graduate of the Montana School of Mines, Dugan has worked for Anaconda Copper Mining Co., of which International is a subsidiary, since graduation.

H. J. Vander Veer, lands and mineral staff officer, Region II, Bureau of Land Management, U. S. Department of Interior, resigned that position January 15 to establish a consulting firm, H. J. Vander Veer & Associates. The firm will act in oil and gas, mining, public land and survey capacities.

James P. McDowell has succeeded **William L. Husk** as president of the Western Kentucky Mining Institute. The institute is composed of mine superintendents, assistant superintendents, foremen and entry-foremen of eight western Kentucky coal-mining counties. Other new officers of the group are **Morton Jones**, first vice-president; **Thomas O. Long**, second vice-president, and **Steve Steff**, third vice-president.

Max Kennard, former general manager of Pioche Manganese, Inc., has been appointed vice-president in charge of operations of both Pioche Manganese and Combined Metals Reduction Co. **James F. Orr** succeeds Kennard at Pioche Manganese. For Combined Metals Reduction, **S. E. Craig** is in charge of Utah operations and **Paul Gemmill** in Nevada. **Neal Snyder** is in charge of traffic and ore purchasing for Combined Metals at Pioche, Nev.

Franklin E. Johnson, mine shift-foreman at United States Potash Co., Carlsbad, N. M., since 1947, has been promoted to mine mechanical supervisor.

Anaconda Copper Mining Co., Butte, Mont., recently announced a number of personnel changes in the Anaconda Reduction Department. **E. A. Barnard**, general superintendent of the Reduction Department since 1941, retired and was succeeded by **W. A. Emanuel** who had been superintendent of the Anaconda Zinc Plant since 1938. **H. J. Maguire**, superintendent of smelting since 1941, also retired and was succeeded by **J. H. McCrea**, assistant smelter superintendent since 1942.

J. R. Moore, former superintendent of the Ferromanganese Plant, has been promoted to superintendent of the Ore Crushing and Conveyor Plant, a new installation in East Anaconda to facilitate handling of ores received at Anaconda from the Butte mines.

C. M. Holstrom, superintendent of leaching at the Zinc Plant, succeeds Emanuel as superintendent of Zinc Plants. Moore has been succeeded as superintendent of the Ferromanganese plant by **E. S. Kramlich**, former assistant superintendent of that plant.

— *Obituary* —

Sam Cather, 88, pioneer Neck City, Mo., mining man, died January 21. Mr. Cather began his mining career in about 1898, when he and two other men established the Rubberneck mine a short distance west of Neck City. He was engaged in mining in the area until 1919.

Ralph E. Jamison, 68, president of the 62-year-old Jamison Coal and Coke Co. and a former president of the Western Pennsylvania Coal Operators Association, died January 21 at his home in Greensburg, Pa. Mr. Jamison had been ill for several years, but continued to make daily trips to his office.

A graduate of Princeton, he started work with his family's company in 1910, and became its president in 1945.

Henry Hardenbergh, 72, chairman of the board of directors of The New Jersey Zinc Co., died February 10 in New Rochelle, N. Y.

Mr. Hardenbergh was born in North Adams, Mass. He was graduated in 1904 from Harvard. The next year he joined New Jersey Zinc as a chemist. He became president and a director in 1943 and board chairman in 1951.

Russell Thayer, 72, vice-president of the General Coal Co., died at his home in Haverford, Pa., December 31. Mr. Thayer was also vice-president of the Interstate Railroad, the Stonega Coke and Coal Co., the Virginia Coal and Iron Co., Wentz Corp., Westmoreland Coal Co. and Westmoreland, Inc.

Norman Raymond Decker, 64, former superintendent of the New River and Pocahontas Consolidated Coal Co., died December 21 in Fayetteville, W. Va. Mr. Decker had been a resident of McDowell County, W. Va., for 25 years and supervised mine operations at Berwind, Capels and Havaco.

Edward Perry Loud, 75, who retired in 1948 as general superintendent of the Atlantic Branch of the National Lead Co., died January 24 at his home in Metuchen, N. J.

Mr. Loud joined the United Lead Co. in Buffalo in 1905 and spent most of his business life with that firm, which later became National Lead.

Layman Cutbirth Webb, 50, chief electrician of Jewell Ridge Coal Co., died January 13 in Richlands, Va. He had been employed by Jewell Ridge since 1940.

W. Dale Hawley, 52, division manager for high volatile mines of Eastern Gas and Fuel Associates, died in Charlottesville, Va., January 29.

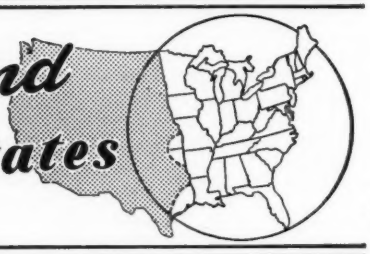
Mr. Hawley joined Eastern Gas and Fuel in 1953. He had held positions as engineer, foreman, assistant superintendent and superintendent at a number of southern West Virginia coal mining operations since 1926.

William Booth Bannister, 62, superintendent in charge of stripping for the Pittsburgh Coal Co., Division of Pittsburgh Consolidation Coal Co., died in New Castle, Pa., January 13.

Joseph Frederick Featherstone, 73, president and manager of the Commonwealth Lead Mining Co., died January 16 in Salt Lake City.

Mr. Featherstone began his connection with the mining industry in 1924. At one time he was vice-president and general manager of Western Alloys, Inc., which mined manganese ore in Lander County, Nev.

Eastern and Central states



Inland Buys Property

On January 24 the Elkhorn Coal Corp., with headquarters in Charleston, W. Va., announced the sale of about 15,000 acres of coal land in Eastern Kentucky to the Inland Steel Co. The land had been under lease to Inland Steel which operates one mine on the property.

Elkhorn had leased the land, on a royalty basis, for about 20 years or more to Inland. Purchase of the property by Inland will eliminate royalties paid to Elkhorn.

Repair Peninsula Hoist

Production at the Peninsula Mine of the Calumet Division, Calumet & Hecla, Inc., resumed January 31 after repair work on the steam hoist had forced a 31-day shut-down. The mine is located at Calumet, Mich.

During this period, employes of the mine were transferred to the Division's Centennial, Seneca and Ahmeek No. 3 Mines, and to the hoist repair job. Three-shift, around-the-clock schedules were set up at Centennial and Seneca to make use of the additional personnel.

Peninsula Mine closed December 31, and repair work began January 3. To rebuild the hoist it was completely taken out; an identical hoist nearby was torn down so its parts could be used. The idle hoist, located in the Peninsula hoist house, was formerly used for Ahmeek No. 3 Mine.

It took only 19 work days and 48 shifts to complete the job. This was well ahead of the original estimate of six weeks.

Production at Peninsula is about 1000 tpd, but much of this was made up by increased production at Centennial and Seneca.

Triple Cement Plant Output

Lehigh Portland Cement Co. has announced that, to relieve the chronic cement shortage in the Baltimore, Md., and Washington, D. C., markets, it will expand its Union Bridge, Md., plant to the point that production will be more than 300 percent of present rated capacity. This added production will make it possible to furnish an adequate supply of all types of cement to Lehigh customers in the territory it serves, according to the cement company.

Honor S. A. Braley

The Pittsburgh Junior Chamber of Commerce recently selected Dr. S. A. Braley to represent the profession of scientific research in its Pittsburgh Men-of-The-Year awards.

Since 1946, Dr. Braley has been head of the Mine Acid Control Fellowship at Mellon Institute. In February of last year he published a 300-page report which describes the fundamental mechanism of acid formation and suggests procedures for its control. Although a complete solution to the problem has not been found, the report has been widely acclaimed for its scientific integrity and constructive usefulness.

Dr. Braley has shown how coal can be stripmined without acid production, and that the careful control of water flow in operating mines will aid in preventing an increase in acid production as a result of increased mining activity. The fundamental information included in the report has laid a foundation for development of improved acid-control measures.

J. W. WOOMER & ASSOCIATES
Consulting Mining Engineers
Modern Mining Systems and Designs
Foreign and Domestic Mining Reports
HENRY W. OLIVER BLDG.
Pittsburgh, Penna.
NATIONAL BANK BLDG.
Wheeling, W. Va.

PETER F. LOFTUS CORPORATION
ENGINEERING and ARCHITECTURAL CONSULTANTS and DESIGNERS
First National Bank Bldg.
Pittsburgh 22, Pennsylvania
Cable Address
"LOFTUS Pittsburgh"

DAVIS READ
Consulting Engineer
Layout Operation
Modern Production Methods
Plant Design Preparation
120 S. LaSalle St.
CHICAGO, ILL.

Close More Anthracite Operations

Philadelphia & Reading Coal & Iron Co. has closed its Locust Gap and Potts mines, the Locust Summit Central Breaker, and two stripping operations adjoining the mines. The company reports that the action was made necessary by marketing conditions.

The Locust Summit Central Breaker was built in 1927 as the world's largest anthracite breaker. It handled the raw coal produced by the Locust Gap and Potts mines. The properties are in Schuylkill and Northumberland Counties, Pa.

AZI-LIA Meeting

The 27th annual meeting of the Lead Industries Association will be held jointly with the American Zinc Institute at the Drake Hotel in Chicago, Ill., April 27-29.

The first day will be confined to the activities of the Lead Industries Association. Business sessions, both morning and afternoon, will be devoted to reports evaluating current and new uses for lead with the annual business meeting, as well as division and committee meetings.

Thursday morning, a joint AZI-LIA session will be conducted at which the outlook for the lead and zinc producing industries and reserves will be discussed.

Thursday afternoon and Friday will be confined to the activities of the American Zinc Institute.

Members of both associations are invited to participate in all the activities of the joint meeting. Social activities will include LIA's traditional luncheon and cocktail party on Wednesday and a joint AZI-LIA luncheon on Thursday. An AZI cocktail party and dinner will be held Thursday evening and a luncheon on Friday.

Base Metal Ores Tested

Just over two years after a base-metal strike on the site touched off the greatest staking-rush in Canadian mining annals, Brunswick Mining & Smelting Company's newly completed 150-ton pilot mill commenced trial runs at the company's Brunswick mine 20 miles southwest of Bathurst, N. B., Can., early in February.

Designed to test ore from the company's Brunswick-Anacon operations, completion of the plant marks another mile-post in the development of the multi-million dollar base metal deposits turned up by B. M. & S. president, M. J. Boylen, and associates on their Brunswick, Anacon, New Larder "U" and Keymet holdings in the Bathurst area since January 1953.

L. Riggs, B. M. & S. resident manager, explained that pending the erection of a 4000-ton concentrator—already in the planning stage—at a location not too far from the Brunswick-Anacon operations, concentrates from the pilot mill will be stockpiled or shipped to a smelter.

Also currently under study, he added, are several methods of moving the ore from the Brunswick-Anacon mines to the as yet undetermined site of the proposed concentrator. George F. McGowan, a New York transportation consultant, has been engaged to make a survey of the various plans.

. Riggs disclosed that current plans for Brunswick call for stripping to a depth of 250 ft on a 1700-ft by 300-ft section before sinking a shaft.

At Anacon he said the No. 1 shaft is down to the 412-ft level. Plans call for the sinking of a second shaft to a possible depth of 4200 ft with a planned first depth of 1850 ft.

First of the Boylen interests' Bathurst mines to go into production, Keymet, some 16 miles north of Bathurst, employs 125 men at the 200-ton plant and has reserves of high grade ore for several years. The mine shaft has been sunk 1200-ft.

At New Larder "U" the company is sinking a shaft. Already in the planning stage is the construction of a mill of a minimum 1000 tons and possibly an even larger one will be required. The mine is reported capable of going to a 2000-ft depth, and the plant's geared for an extensive underground program.

Move New York Offices

The New York offices of American Potash & Chemical Corp. have been moved to new quarters at 99 Park Ave., according to an announcement from company headquarters in Los Angeles.

Previously the company had maintained offices in the Chanin Building at 122 East 42nd St. The company's current expansion program prompted the move.

To Buy Feldspar Mines

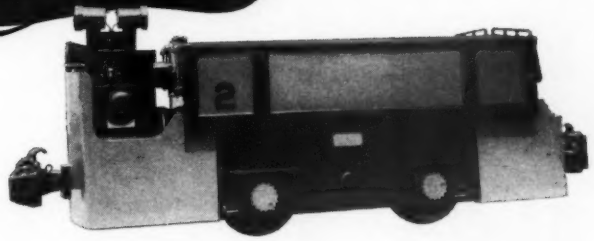
According to a recent news item, Pacific Tin Consolidated Corp. of New York City has agreed to purchase four feldspar companies, in three Southeastern States. The move is part of the company's policy to expand its mining operations. Acquisition of the feldspar properties will be the first venture in feldspar mining and processing for Pacific Tin in the United States.

Other companies concerned in the transaction are Feldspar Flotation Corp. of Spruce Pine, N. C.; Feldspar Milling Co. of Burnsville, N. C.; North Carolina Feldspar Corp. of Erwin, Tenn., and Appalachian Minerals Co. of Monticello, Ga.

GREENSBURG EIGHT TON MONITOR

Storage Battery Locomotives

...for top performance "Double Equalizers" make the difference



The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

GREENSBURG MACHINE CO.

112 Stanton St.
GREENSBURG, PA.

N. J. Zinc in Uranium Search

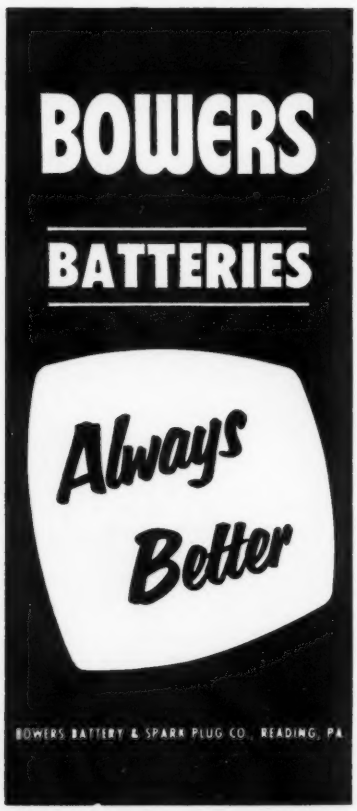
Exploration for uranium in the Blind River area of the province of Ontario, Canada, is being undertaken by The New Jersey Zinc Exploration Co. (Canada) Ltd., a subsidiary of the New Jersey Zinc Co. Also associated in the exploration activities is the Nueva Exploration Co., a new corporation affiliated with The Texas Co.

The Blind River area is in the Lake Huron region of Ontario where uranium deposits already have been discovered.

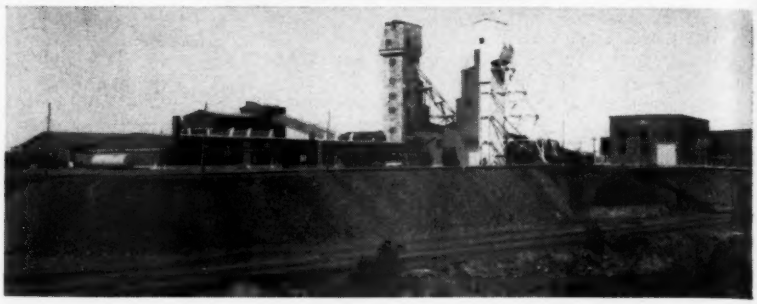
McGraw Settles With J&L

F. H. McGraw & Co., engineers and constructors, has announced that its differences with Jones & Laughlin Steel Corp. with respect to the design and construction of a coal washing plant completed for J&L in East Fredericktown, Pa. in 1949 have been settled.

No details of the differences nor the basis for settlement were given except to confirm that this was a matter which had been pending in litigation by suit and counter-suit, each of which involved more than $3,000,000. Depositions-before-trial had been completed by each party and the trial had been set down for the February term in the U.S. District Court, Pittsburgh.



Save 20 Months on Shaft Project



The International Nickel Co. of Canada, Ltd., in an undertaking at the Stobie section of its Frood-Stobie Mine in the Sudbury District of Ontario, recently completed driving a shaft from the bottom up. The result was that the project was completed some 20 months earlier than otherwise would have been possible and with a saving of many man-hours of labor. The project was undertaken in conjunction with Inco's underground mining expansion program.

The shaft is part of a two-shaft hoisting plant that will handle a daily quota of 18,000 tons of nickel-bearing ore. The twin shafts, Nos. 7 and 8, are less than 100 ft apart, this arrangement being decided upon not only to provide the needed hoisting capacity but to give flexibility of operation.

Unlike No. 7 shaft, which had to be sunk from the surface, gravity was put to work in the No. 8 shaft. Driving upwards at the same time from each of five crosscuts driven from No. 7 shaft at 400-ft vertical intervals, a pilot raise was carried through from the 2000 level to surface. The pilot raise was then widened to full size and concreted, working from surface down and drawing off the broken rock at the bottom.

No. 7 shaft was sunk from surface to the 3000 level a decade ago. It is equipped with cages for handling men and supplies and with skips for hoisting ore. Through it the mine has now been developed down to the 1400 level. Deep exploration has been carried on from the 3000-ft level. No. 8 shaft, completed in 1953 to a depth of 1900 ft for first stage hoisting, handles only ore.

Ore loading pockets for first stage hoisting at No. 7 and No. 8 shafts are at the 1800 level. Crushed ore is delivered by belt conveyors from underground storage bins below the crushers to one or other of the shafts independently or to both shafts at the same time for hoisting.

At No. 8 shaft the ore is loaded into bottom-dump skips that carry a 15-ton pay load and are hoisted at a speed of 3000 fpm. The hoist is semi-automatic, driven by two 3000-hp d-c motors and operated from the loading pockets by push-button control. It is capable of hoisting 750 tph of ore.

White Pine Producing

The White Pine Copper Mine of the White Pine Copper Co. went into production in mid-January. Construction of the mine, located at White Pine, Mich., began in March 1952 and now is essentially completed along with construction of townsite and all utility facilities.

New Dock for St. Joe

Barge shipments from the St. Joseph Lead Co.'s smelter plant at Monaca, Pa., will be facilitated by a new dock constructed for the company on the Ohio River, 28 miles downstream from Pittsburgh, by The Contracting Division of Dravo Corp.

Central point of the dock is a 31-ft diameter cell of steel sheet piling to support a whirler crane that will transfer zinc from the shore to barges. Base of the crane will be nested in a 22-ft deep recess 16 ft in diameter built into the center of the cell.

The barge to be loaded will be moored to two steel sheet pile posts flanking the main cell. The posts and the cell extend 23 ft above normal pool level.

Test Canadian U Claims

Stanleigh Uranium Mining Corp. Ltd., an affiliate of Standard Ore and Alloys Corp., New York City, has started work on its mining properties consisting of some 20 sq mi in the Blind River region in Canada, adjoining the Algom deposits.

A permanent winter camp has been established and a road built to the property, with diamond drill rigs now in operation. The drilling program calls for preliminary drilling of 18,000 ft.

SPECIAL OFFER

WHILE THEY LAST

Coal Mine Modernization

(1952, 1953 and 1954 Editions)

Handbooks of Practical Coal Mining

You'll find Coal Mine Modernization a treasure house of information on progress and developments in coal mining—both underground and strip. These volumes tell the complete story, by means of authoritative accounts showing how progressive companies are meeting production, preparation and management problems.

Order now while the supply lasts. Handsomely bound in flexible covers, arranged in handy-to-use form and fully illustrated, Coal Mine Modernization is a welcome addition to any mining man's library.

Special price $2.50 each—set of three editions only $6.50.

Send in your order today.

SPECIAL PRICE $2.50 each Set of 3 editions $6.50

SEND IN YOUR ORDER *Today*

American Mining Congress

Ring Building • Washington 6, D. C.

Specialists in Economy for BRONZE REPLACEMENT PARTS

HI-QUALITY BRONZE MACHINED TO A PERFECT FIT

Flood City specializes in making bronze bearings and replacement parts from a superior grade of hard, long-wearing bronze . . . machined by experts to a perfect fit!

Standard bronze replacement parts for all types of mining equipment are carried in stock and prompt delivery can be made from both Johnstown and Charleston, W. Va. Good service is also available for special parts and bearings made to your specifications.

Our specialization results in greater economy for you . . . always specify Flood City Bronze Replacement Parts.

FLOOD CITY
BRASS & ELECTRIC CO.
JOHNSTOWN, PA.
SALES AGENT:
KANAWHA RAIL & MACHINERY CO.
CHARLESTON, W. VA.

TVA Buys Coal

On February 1 the Tennessee Valley Authority announced the award of contracts to 12 coal mining companies for 3,352,610 tons of coal. Of this total 2,261,610 tons will be used at TVA's Kingston, Tenn., steam power plant and 1,091,000 tons of the coal will be used on TVA coal-fired plants at Shawnee, Ky., Johnsonville, Tenn., and Colbert, Ala.

Shops for Taconite Workers

Modern shopping centers at Reserve Mining Company's two new taconite towns opened for business the first week in February.

At Babbitt, Minn., where Reserve's taconite mine is located, the new business center has 16,279 sq ft of store space and will have a hard-surface parking area for about 230 automobiles.

At Silver Bay, Minn., where construction is under way on the huge E. W. Davis Works, where the taconite will be processed into iron ore pellets, the shopping center provides 22,327 sq ft of store space with a paved parking area for nearly 250 automobiles.

CW&F Now Part of Freeman

The Chicago, Wilmington and Franklin Coal Co. will function as the Orient Coal Division of the Freeman Coal Mining Corp. of Chicago, it has been announced by Colonel Henry Crown, chairman of Material Service Corp., parent company of Freeman.

Colonel Crown last month announced the acquisition of C.W.&F. for approximately $12,000,000. The addition of the three Orient mines to the three Freeman mines makes Freeman the largest producer of Illinois coal and one of the largest coal companies in the country.

"This vast coal production capacity of Freeman Coal Mining Corp. will afford many advantages, particularly to large volume coal consumers such as electric utilities. Freeman has the safest and most efficient coal mines and the most modern coal sizing and cleaning plants in the country," Colonel Crown said.

Barton Gebhart and Earl Snarr, both vice-presidents of C.W.&F. have been elected vice-presidents of Freeman, and C.W.&F. sales manager, J. J. Riely, has been appointed to the vacant post of sales manager of Freeman, it was announced by Frank Nugent, executive vice-president of Freeman.

Stuart Colnon, president of Freeman, said that the production and sales organizations of C.W.&F. and Freeman will be combined.

CMI

CONTINUOUS CENTRIFUGAL means

1 BETTER COAL DRYING

. . . so much better, in fact, that C-M-I Dryers are piling up new records for economy and efficiency in preliminary dewatering operations.

. . . so much better that C-M-I Dryers are not only replacing costly heat drying in preliminary dewatering but, in many cases, are eliminating entirely the need for heat drying.

2 BETTER SLURRY RECOVERY

Marketable coal—thousands of tons of it—is being reclaimed from slurry by C-M-I Continuous Coal Dryers Dryers . . . at a cost so low as to make this operation extremely profitable. Yes—slurry reclamation CAN be profitable—when done the C-M-I way. Find out HOW and WHY...

SEND FOR FREE BROCHURE

C-M-I Centrifugal DRYERS

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.
146 PRESIDENT ST.
ST. LOUIS 18, MO.

Accident-Free Year

The Duluth, Minn., plant of the Universal Atlas Cement Co. worked its 12th accident-free year in 1954, according to an announcement by Martin E. Linquest, manager of the United States Steel subsidiary operation.

Giving credit to the men, Linquest said, "We have an excellent safety program but we could not have accomplished this record without the full support and cooperation of every man in the plant." The 325 men employed there worked a total of 632,000 man-hr in 1954 without a single lost-time accident.

This is the first calendar year since 1946 that the cement plant has been able to achieve this goal. The last lost-time accident occurred on March 12, 1953.

In recognition of this accomplishment, the Portland Cement Association will present the plant with a safety award at ceremonies to be held there this summer.

Taconite Pioneer Honored

Prof. E. W. Davis, whose pioneer research in the beneficiation of low-grade iron ore turned out to be a cornerstone for the taconite industry, was honored in Cleveland, Ohio, January 17 for his contributions to the Great Lakes steel industry. Prof. Davis and his staff at the University of Minnesota, where he was for many years director of the Mines Experiment Station, devised a method to process taconite. Research by Davis and others led to the development of a means by which the rock can be crushed and its iron content recovered.

Census of Mineral Industries

Signing of an agreement under which the Bureau of Mines, Department of the Interior, and the Bureau of the Census, Department of Commerce, will cooperate in gathering statistics of mineral production and other operations of some 40,000 establishments in the Nation's mineral industries was announced January 5 by Secretary of the Interior Douglas McKay and Secretary of Commerce Sinclair Weeks.

The main purpose of the agreement is to assure that the special knowledge of Bureau of Mines technically trained commodity experts and the special skills of the Census Bureau in the collection, summarization, and publication of masses of statistical data are effectively blended in the conduct of the first Census of the Mineral Industries to be taken since 1939.

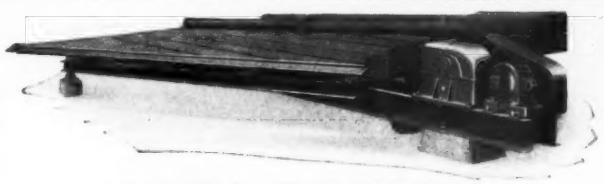
The agreement has another important aim: to provide against duplication of effort and thereby reduce the reporting burden on the mineral industries.

Winifrede & Carbon Fuel Merge

Official sanction of the merger of Winifrede Colleries with Carbon Fuel Co. was given in late December by stockholders of the two companies at a meeting held in Charleston, W. Va. The proposed merger of the two West Virginia coal producers was disclosed late in November, but official action was not taken until the stockholders of the two firms met and voiced their approval of such action.

Mining interests owned by Winifrede in Mingo and Fayette counties, W. Va., and in Buchanan County, Va., were not involved in the action. Through the merger, Carbon Fuel will add to its property 11,000 acres of coal lands held by Winifrede Collieries under long-term lease in Winifrede Hollow where the latter company operates one mine. Carbon Fuel took over operation of that mine on January 1.

Properties of the two companies are about 10 miles apart in Kanawha County, W. Va.



SuperDuty* Table Efficiency Unmatched in Concentration

The separation of values from sand or finest slime feeds is achieved with maximum efficiency by the SuperDuty DIAGONAL DECK* Concentrating Table. Every part of the table is designed to work perfectly with every other part. SuperDuty's high potential deck, its factory aligned underconstruction and proved running-in-oil head motion all work together to keep the pulp moving rapidly and uniformly for separations recognized as marvels of efficiency. Results are highest grade concentrates, lean tailings and reduced middling loads for recirculation . . . hence more tons of new feed per day.

For complete information ask for Bulletin 118-B.

*Registered Trademark.

CONCENCO* Type "CPC" Classifier

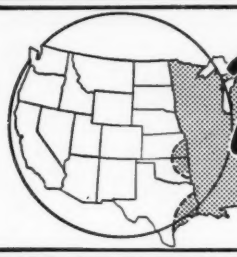
This all steel Constriction Plate Classifier is available in 1 to 10 or more cells. Novel secondary classification sharpens the separations made by each main cell. Advantages offered are: (1) accurate classification or sharp sizing, (2) easy and effective hydraulic water regulation, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts, (6) low maintenance cost.

THE DEISTER* CONCENTRATOR COMPANY

CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

917 Glasgow Ave. • Fort Wayne, Ind., U.S.A.



Western States

Calaveras Expansion

The board of directors of Calaveras Cement Co. has approved an additional half million dollar expansion program for its San Andreas, Calif., plant, bringing the total of the company's commitments for plant improvements to over $1,000,000 since November of 1954.

Included in the new appropriation are increased clinker storage, new separators and elevators in the finish mill and four new cement storage silos. These will increase the plant's effective capacity about five percent.

Announced in November, the program already is well along to completion. It includes quarry, plant and shipping department improvements and also a new batching plant for the company's wholly-owned subsidiary, Stockton Building Materials Co.

New Gismo Use

The "gismo," a self-loading transport invented by Dale I. Hayes, manager of western operations for American Zinc, Lead and Smelting Co., will soon be put to a new use. In the type of development planned for the Grandview mine in Pend Oreille County, Wash., the gismo will self-load rock and then back up onto a string of cars by way of a ramp to load them. One gismo load is a carload. After the face has been cleaned up, the ramp will be folded onto one car and the trip of cars will be pulled away from the working face, carrying the gismo with it. The area thus will be left clear of equipment and drilling can be resumed.

The new 500 level, on which the experiment will be tried, will be 11 ft high and 11 ft wide. The operators expect to muck out a 100-ton round and load it into mine cars in less than an hour.

Wasa-Shamrock Activity

Western Montana Exploration and Development Co. plans to install a mill early this spring at its Wasa-Shamrock operations in Granite County, Mont., if current efforts to finance the project are successful. A 300 to 500-tpd heavy media plant is under consideration and negotiations are now in progress with the Small Business Administration for a portion of the funds to finance the plant.

The Wasa-Shamrock deposit, located 10½ miles southeast of Hall, Mont., contains a sizable tonnage of ore with values in lead, zinc, copper, cadmium, indium, tungsten, silver and gold. The company is now preparing the orebody for open-pit mining.

Further diamond drilling, both underground and from the surface, is also planned this year to gain further information about the downward extension of the ore zone.

Mine Ore Near Butte

Stockholders of Mentor Exploration and Development Co., a Toronto, Ont., mining company, recently learned that the company has been successful in finding ore in the Basin-Jib Mines, about 35 miles from Butte, Mont. Past production from these mines was mainly gold and silver with lesser amounts of lead and zinc, and, at present prices, would be worth about $5,000,000. A recently completed diamond drill program outlined the orebody of the Basin-Jib property.

Miners Legal Guide

A new reprinting of the guide to the mining laws of California for use by prospectors and miners, issued by the Division of Mines, has been released.

The pamphlet, entitled LEGAL GUIDE FOR CALIFORNIA PROSPECTORS AND MINERS, compiled under the direction of L. A. Norman, Jr., of the staff of the Division of Mines, deals with the manner of locating and holding mineral claims, mineral patents, state and federal lands, water rights and water pollution regulations, safety regulations, and gold-buying rules.

As the title indicates, the publication is intended as a handbook for the use of those interested in mines and mining; it contains information of a general nature for those wishing to establish rights to a new mineral discovery, or to maintain rights on an already established one.

The book, first issued as a supplement to the July 1952 issue of Mineral Information Service, contains 78 pages and three figures. It is priced at 25 cents, plus three per cent sales tax, and may be ordered from or purchased at the Division of Mines Offices in the Ferry Building, San Francisco 11.

GEIGER & SCINTILLATION COUNTERS

The Very Best in Field Reliability, Sensitivity, Linearity, Construction, Overall Performance

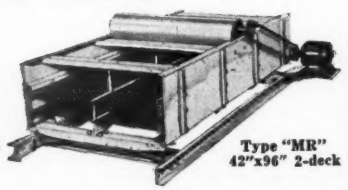
★ NEW URANIUM SCOUT Series Field Geiger Counters.
★ NEW Premium Scintillation Counters.
★ NEW Field Geiger Counter—Digit Scaler. Records Counts for 30 or 60 Sec Interval.

SEND FOR NEW 1955 CATALOG

FISHER RESEARCH LABORATORY, INC.
Dept. C
1965 University Ave. Palo Alto, Calif.

UNIVERSAL

- Vibrating Screens—All Sizes and Types
- Unilec Heating Equipment
- Uniflex Vibrators
- Univibe Riddles
- Write for New Catalog No. 150


Type "MR" 42"x96" 2-deck

UNIVERSAL VIBRATING SCREEN CO.
RACINE ~ ~ WISCONSIN

Start Mine-Mouth Plant

The mine-mouth power plant of Utah Power & Light Co. at Castle Gate, Utah, went into operation last December. The power plant is presently taking 850 tpd of coal from the Castle Gate mine of the Independent Coal & Coke Co.

All Open Pit at Ray Now

Kennecott Copper Corp. has closed its underground mine at Ray, Ariz., after 43 years of continuous operation which yielded more than 64,000,000 tons of ore. For several years the company's Ray Mines Division has been converting to an open-pit operation which will now be expanded to equal the output of the previous underground and open-pit sections.

Uranium Mining Contractors

A group of men representing the contracting and heavy equipment industry in the midwest have formed the Missouri Uranium Corp., and have acquired lease to more than 57,000 acres and nearly 3000 claims in New Mexico.

Missouri Uranium plans to engage in three distinct categories of operation, according to Raymond E. Bair, president. He said that operations would consist of the removal of ores from proven orebodies under operating contracts with the owners; the actual mining, production, and sale of ores from Missouri Uranium's own claims and permits; and the sale of claims and permits to individuals, partnerships, and corporations who might desire to purchase same.

Open Wyo. Ore Station

Wyoming's first uranium ore buying station was opened January 8 with test operations at Riverton. Cecil Swain, job superintendent for the Walker-Lybarger Construction Co. of Grand Junction, Colo., supervised adjustment of conveyors and other equipment to open the station.

CF&I Alters Coke By-Product

Successful changeover in the Pueblo, Colo., coke oven plant of The Colorado Fuel and Iron Corp. to permit the large scale production of diammonium phosphate for high analysis fertilizer has just been completed, it was announced recently by John D. Price, coke plant superintendent. CF&I is the first major coke oven operator to make such a move.

Production of diammonium phosphate, a fertilizer, to be marketed by the company under the trade name of "DAP," will take the place of ammonium sulfate, the conventional by-product of the coke oven operation.

Only relatively minor changes had to be made in the production facilities to accomplish the change, Price said. Instead of removing the ammonia from the coke oven gases by scrubbing through sulfuric acid, CF&I has substituted electric furnace phosphoric acid. The practicability of the new method was proven in a full scale plant production test during the summer of 1954.

Test-Drill United Copper Vein

Diamond drilling operations got under way early in January at the old United Copper mine in Stevens County, Wash. The drilling is the first step in an exploration contract signed in October with the Defense Minerals Exploration Administration by the Chewelah Copper Co.

Three holes will be run from the main adit level about 600 ft out into the footwall of the United Copper vein to test the Keystone vein found many years ago but never explored. Chewelah Copper has done surface trenching on what is believed to be the same structure. If drill core results justify, the vein will be opened by 1400 ft of crosscutting and drifting.

Readying Placer Mine

According to the publication of the Oregon State Department of Geology and Mineral Industries, the Ore.-Bin, Wesley Pieren and Antone J. Nielsen of the Evergreen Mining Co. have started to strip overburden prior to placering for gold on Galice and North Fork Creeks in Josephine County, Ore. The company holds six claims on North Fork Creek and eight on Galice Creek.

U. S. Gets Canadian Nickel

The International Nickel Co. of Canada, Ltd., has made the first shipment of approximately 450,000 lbs of refined nickel to the General Services Administration of the United States Government under a contract signed between the company and the government agency last fall, providing for refining of nickel concentrates produced by Sherritt Gordon Mines Ltd.

The contract called for delivery of a minimum of 4,500,000 lbs of refined nickel in the period ending August 1955. As a result of improvements to its procedure for treating this concentrate, International Nickel will be able to increase deliveries materially beyond the contract minimum.

The concentrate being treated and refined by Inco represents an excess of Sherritt Gordon's Lynn Lake, Manitoba, mine production over the quantity required for processing at its refinery at Fort Saskatchewan, Alberta.

CONCENTRATES FOR SALE

Rare-Earth Oxides. Bastnasite and ThO_2. High Grade Concentrates Available in Ton or Carload Lots

NEW MEXICO COPPER CORPORATION

Carrizozo, New Mexico

To Expand Potash Plant

Plans to increase the capacity of the International Minerals & Chemical Corp., Carlsbad, N. M., plant were announced by A. Norman Into, IMCC vice-president. Planned revisions should make it possible to increase production of potassium sulphate about 40,000 tons per year. Engineering on the project is well under way and all major equipment has been ordered. Stearns-Roger Mfg. Co. will be in charge of construction work. This is the second major expansion in the production of potassium sulphate by International in the last two years.

Texas Quicksilver Activity

Furnaces are being fired up at two quicksilver mines in the Big Bend area near Lajitas, Texas. Others may also open soon. The Rainbow, midway between Lajitas and Study Butte, will be the first to return to production. It will be followed by the Fresno mine.

Mercury production in this area came to a standstill in 1946.

Lease Apache Asbestos Land

Bids for the leasing of asbestos mining property on the Fort Apache Indian Reservation were opened in the office of the Fort Apache Agency at Whiteriver, Ariz. on December 14. The property on which bids can be made contains about 200 acres and is located on the Apache Extension Claims 1 through 10, west of Cibicue Creek and about a mile northeast of the East River. The 10-yr leases must be approved by the Secretary of the Interior and the White Mountain Apache tribe.

Plan Uranium Concentrator

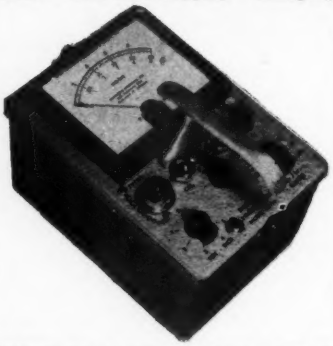
An up-grading mill of 200 tpd capacity is to be built on U-Beva Uranium Co., property in Beaver county, Utah, according to company officers. Atom Engineers of Salt Lake City are on the firm's property at present to select the site for erection of the mill.

The mill, it is said, will be able to take .05 percent ore and boost it to 1.5 percent. The facility also will be built so it can be enlarged to handle custom work if demand is great enough. The site is on North Creek, just east of Beaver, Utah.

FIND MORE URANIUM PER $ SPENT

SCINTILLATION COUNTERS

THE ONE, ALL-PURPOSE INSTRUMENT
MODEL SC-10 For Field—Mobile—Airborne — Drill Hole Logging — Assaying



MODEL SC-10 (pictured above)	$595.00
DRILL HOLE PROBE	75.00
MODEL 111-B	495.00
MODEL 117	299.50
MODEL 118 ROYAL	1,995.00

AIRBORNE SCINTILLATION COUNTERS

SAB-7 OPTIMUM MODEL	$2,810.00
MODEL SAB-11 (Includes 3 in. Crystal)	2,350.00
RECORDER FOR SAB-7, SAB-11 EXTRA	400.00

GEIGER COUNTERS

MODEL 106B	$99.50
MODEL 107B	139.50

DRILL HOLE LOGGING

MODEL 120 with 50 ft probe.. Extra Cable 25c a ft	$289.50
INDUCTO-REEL	$1,250.00
With RECORDER	1,650.00

Airborne Radiometric Survey Service Now Available

ENGINEERS SYNDICATE, LTD.

"The Most Experienced Supplier to the Uranium Industry"
5011 Hollywood Blvd.
Hollywood 27, California
PHONE: NOrmandy 3-9284
BRANCH—337 N. Main St., Moab, Utah
PHONE: Alpine 3-4381

Red Cloud to Produce

Red Cloud Mine Development Co. has announced that work on a mine in the Panamint Mountains near Argus, Calif., has been progressing since last April and it is expected to produce lead carbonate shortly. A 75-ft shaft was sunk into the orebody and present operations include the driving of a 400-ft tunnel to contact the orebody at a lower level.

Death Free Year

Wyoming State Mine Inspector Lyman Fearn reported that 1954 was the first year in the history of Wyoming that no fatalities in the state's mines and quarries were recorded. Five men were killed in 1953, two in mines and three in the trona industry. Fifteen men were injured during the first 9 months of 1954, compared with 33 in the full year of 1953.

Ophir Mine to Close

Lead and zinc mining operations at the Silver Bell Mines Co., at Ophir, Colo., have been suspended and the mine will be completely shut down after present ore broken on stopes and chutes is pulled, it was recently reported by A. A. Smith, general superintendent. He indicated that about three months would be needed to pull and mill the ore. Machinery will be removed from the mine and stored.

Silver Bell is going actively into the uranium mining business, having acquired property on Monogram Mesa in Montrose County, Colo. Drilling operations there will begin shortly.

Midnite Mine

With a bulldozer, James LeBret is scraping overburden from a hillside at the Midnite Mines, Inc. property on the Spokane Indian Reservation in Washington State. The mine was discovered by LeBret and his brother recently near Lookout Mountain on the reservation. The company has shipped over 200 tons of ore so far, and has more stockpiled on the property. It is the only producing uranium mine in Washington.

Haggard & New Bought

The Ore.-Bin, publication of the Oregon State Department of Geological and Mineral Industries, reports that the Burt Hayes' interest in the Haggard and New chromite mine near John Day, Ore., has been purchased by C. G. Cafarelli, Salt Lake City, and J. J. Kinsella, Belview, Idaho. Kinsella is in charge of operations on the property.

Future plans call for enlargement of both mining and milling capacity, although the old Hayes mill is still being used at present. Hayes reopened the Haggard and New, an old property, in the spring of 1953 and except for a few weeks during the worst of winter it has been a consistent shipper.

Close Bullfrog Mine

United States Smelting Refining & Mining Co. has announced plans to close its Bullfrog mine in Grand County, N. M. The property has been on a stand-by basis for several months and it has been decided to pull the pumps to reduce maintenance expenses. J. T. Lewis, Jr., manager, will be transferred to Salt Lake City.

Bully Hill Tests

Glidden Consolidated Zinc Mines, a subsidiary of the Glidden Co., is exploring the old Bully Hill mine, about 20 miles northeast of Redding, Calif. The historic mine was abandoned when Shasta Dam was built and lake water seeped into the mine.

Since last July, the Glidden affiliate has been pumping water out of old shafts and test drilling for zinc ore. The company is not yet able to predict whether the mine will start shipping ore again.

Big Hoisting Day

January 9 was a big day for hoisting engineers at the No. 1 Shaft, Potash Division, International Minerals & Chemical Corp., Carlsbad, N. M. It was their first 12,000-ton day. At that time 12,014 tons of potash were hoisted to the surface. This was done in 21 hours and 22 minutes of hoisting time with nearly two hours' waiting for bin space.

Power of the shaft hoist was increased recently and larger skips installed.

Day Progress

In a letter to stockholders of Day Mines, Inc., Wallace, Idaho, were recently advised that a lower level, the 1100, was being established in late 1954 at the Dayrock mine of the company. Matching funds available from the Defense Minerals Exploration Administration for exploration on the 1600 level were increased and the time limitation extended to August 5, 1955. Production through leasing arrangements continues at a moderate rate from the Tamarack mine and at the Aurum property in Republic, Wash.

It was also made known that preparation to place the Galena Mine on a production basis early in 1955 was in progress. Underground development has been favorable. The mill capacity was increased to 350 tpd approximately, and mine output is being stepped up.

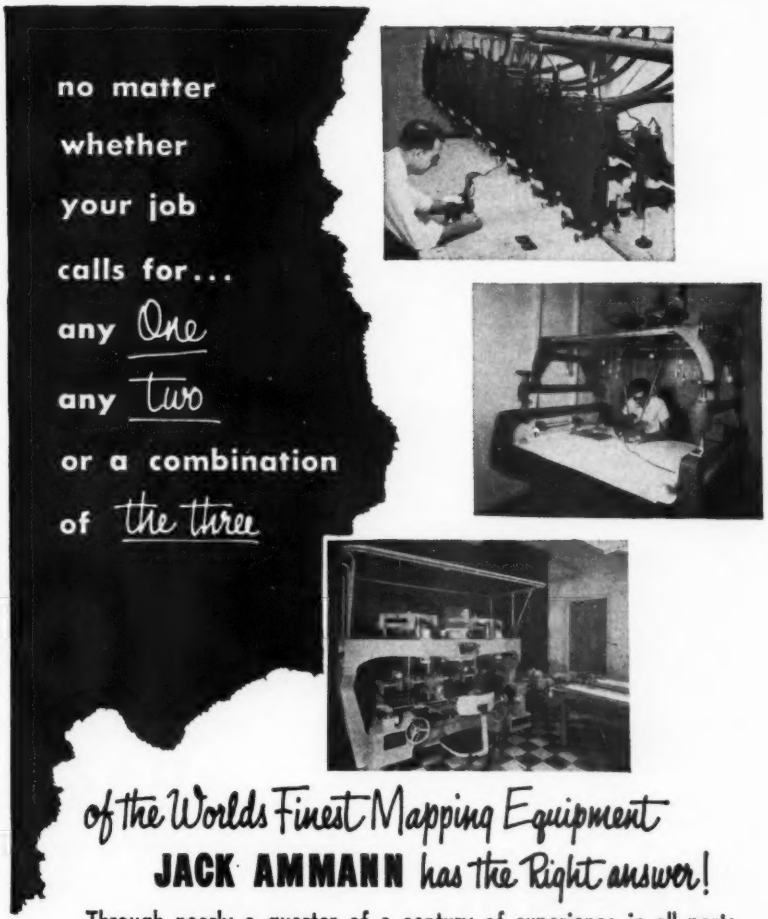
Uraninite in Wyoming

Uraninite has been identified as a principal constituent in at least two of the uranium occurrences in the Pumpkin Buttes area of the Powder River Basin, Wyo.

A black material cementing sandstone was first brought to the surface at the Jeanette #1 claim, Campbell County, Wyo., in September 1954. It was tentatively identified as an unoxidized uranium mineral by geologists of the Geological Survey during investigations undertaken on behalf of the Atomic Energy Commission. Shortly thereafter, identification was verified in the laboratories of the Geological Survey in Denver.

This identification of uraninite is of mineralogic interest because previously in this area uranium has been known to occur only in highly oxidized forms, such as carnotite, tyuyamunite, and uranophane. Also this is one of the few occurrences of uraninite in clastic sediments as young in age as Tertiary.

Further work is in progress on this and associated minerals of the deposits to better understand the geochemical controls for the uranium in the sediments of the Powder River Basin.



of the Worlds Finest Mapping Equipment
JACK AMMANN has the Right answer!

Through nearly a quarter of a century of experience in all parts of the world, Jack Ammann Photogrammetric Engineers have brought the modern science of aerial mapping to unexcelled perfection.

This has been made possible by a happy combination of the right planes, the right men with the right precision equipment. No expense has been spared in obtaining both personnel and equipment of the highest caliber.

For example, the Jack Ammann organization has available for use on your job—or any job where it may be needed—ALL THREE of the world's most highly regarded types of optical equipment for top quality aerial photogrammetric mapping.

These, as technicians will recognize at a glance, are the Multiplex—the Kelsh plotter and Swiss imported Wild A7 Autograph.

Thus, Jack Ammann not only covers the world in providing peerless service in the field of aerial mapping and surveying, but also utilizes the world's most effective instruments—a point of supreme importance to YOU in the execution of YOUR mapping project.

Precise Maps for Cities — Highway Departments — Railroads — Power and Light
Oil and Mineral Exploration and Development — River Development and Irrigation — Etc.

Jack Ammann
PHOTOGRAMMETRIC ENGINEERS, INC
BROADWAY AT TENTH SAN ANTONIO 5, TEXAS
AIR SURVEYS—MAPS

EASTERN OFFICE: Manhasset, N. Y., 32 Hillcrest, P. O. Box 411, Phone Manhasset 7-1840
SOUTHEASTERN OFFICE: Atlanta, Ga., 685 W. Peachtree St., N. E., Phone Elgin 1415
SOUTHWESTERN OFFICE: Houston, Texas, 1354 Chantilly, Phone Oxford 2-1702
WESTERN OFFICE: (Denver) Lakewood, Colo., 995 Flower St., Phone Bel. 3-2090
WEST COAST OFFICE: Fresno, Calif., 53 E. Fedora Ave., Phone 7-7290

Anaconda Reopens Darwin

The Anaconda Copper Mining Co., has announced it is reopening its Darwin lead-zinc mine in Inyo County, Calif. The mine has been shut down since February 1954 when prices of lead and zinc dropped.

Natomas Leases Acreage

The Natomas Co., California gold dredging company, recently acquired a lease, and option to purchase, on 6000 acres on the Utah-Colorado Plateau. No further details will be available, until exploration is resumed.

Research in Nevada

Of the more than $980,000 which the U. S. Bureau of Mines has budgeted to spend in Nevada during the next fiscal year, some $230,000 will be spent on low grade manganese ores and processes; $210,000 for research on the extractive and physical metallurgy of titanium; about $250,000 for work on rare earth metals, about $190,000 will be spent on minerals examination and survey activities in the Nevada-California area; $100,000 is earmarked for operation and maintenance of the U. S. Bureau of Mines stations at Boulder City and Reno, Nev., while $11,000 will go for health and safety work.

LEADING URANIUM PRODUCER

Wants Additional Mines and Claims

One of the nation's major independent uranium mining companies is interested in acquiring several additional producing mines or proven claims. If seller desires, purchaser will consider possibility of offering its own listed securities as partial payment. Please furnish full details. Information will be held in confidence. Box No. 228, care of this publication.

BAGAC

REGISTERED TRADE MARK

philippine hardwood

SHAFT GUIDES

- STRONG, CLEAR HEAVY-DUTY TIMBERS
- LONGER WEARING NON-SPLINTERING
- ECONOMICAL LESS SHUT-DOWN TIME

Write for our technical 12-page illustrated brochure "BAGAC" The Hardwood That Wears Like Iron.

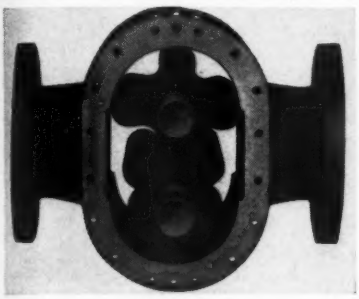
MAHOGANY IMPORTING COMPANY

621 SO. SPRING STREET, LOS ANGELES 14, CALIFORNIA

Manufacturers Forum

Versatile Pump

A positive displacement rotary pump has been announced by the Lindquist Pump Corp., 10001 W. Jefferson Blvd., Culver City 12, Calif. Made in a range of sizes to handle all



types of liquid solutions, pumps are available with capacities up to 2200 gpm and pressures up to 1000 psi. The company reports that a wide variety of fluid material can be handled with the new pumps, including water, high viscosity fluids and solids up to 78 percent.

Increase Prospecting Accuracy

A portable field scaler for uranium prospecting is announced by Fisher Research Laboratory, Inc., Palo Alto,

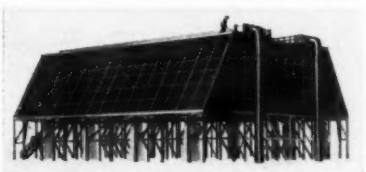
Calif. Known as the "Count-O-Scope," the new instrument records on a precision scaler the actual number of pulses received by the Geiger tube over an automatically timed 30 or 60-second interval. At the end of the selected time interval, the number of counts or pulses observed can be directly read on the four digit scaler. The scaler can be reset to zero and the process repeated indefinitely.

The company reports that grid surveying and detailed field prospecting are greatly simplified through the use of the scaler. Readings at each location can be recorded in a notebook or actually plotted on a map or grid at the time. Background count and small increases above background can be precisely determined.

For further information, contact Fisher Research Laboratory, Inc., Palo Alto, Calif.

Cooling Towers

The cooling tower division of Santa Fe Tank and Tower Co., Inc. has announced a new cooling tower design.



Representing a rearrangement of a standard tower's component parts, the new Santa Fe "Wind-trol" is said to offer improved operating efficiency by controlling recirculation. Santa Fe engineers report that the new design will eliminate the hampering effect of wind on its performance and the tower can therefore be located without respect to wind direction.

For detailed answers on its adaption to industrial needs, address specific inquiries to Santa Fe Tank and Tower Co., Inc., 5401 South Boyle Ave., Los Angeles 58, Calif.

First Machine

LeTourneau-Westinghouse Co. has announced the first new machine completely designed and built by the new company. It is the B Tournapull—a 23-yd single-engine, self-propelled scraper. Struck capacity is 18 cu yd and heaped capacity is 23 cu yd without sideboards. It is powered by a 293-hp diesel engine.

Grease Bomb

Spray-Lube, a new type extreme pressure lubricant has been announced by the Pressure Products Co., P. O. Box 342, West Chester, Pa. It can be

sprayed on open gears, open chains, valve stems, etc., without having to preheat and then apply with brush or paddle. The company says Spray-Lube can be carried in a pocket, and makes possible lubrication of parts a brush or paddle cannot reach. It comes in an unbreakable aerosol dispenser, and is shipped in 6 or 12-can cases.

Vibrate Along

A steam operated vibrator has been added to the line of patented noiseless Vibrolators made by Martin Engineering Co., Neponset, Ill.

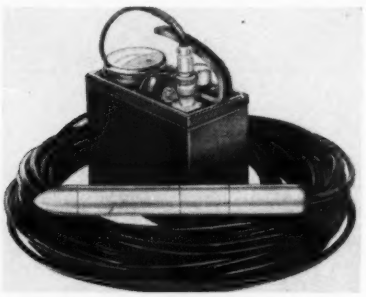
The new vibrator, called the SDV-

35, can be used on: coal bunkers, coal chutes, feed tubes, screens, and many other industrial applications where wet or dry materials must be moved by induced vibration. It may be adapted for steam or air. When used with steam, a return steam line keeps exhaust vapor confined and under control.

Deep Hole Geiger Counter

The Radiac Co., Inc., 489 Fifth Ave., New York, 17, announces the availability of the new DG-9 Drill Hole Geiger Counter, specially engineered to meet the needs for sub-surface uranium exploration operations.

The DG-9 can be used for radioac-

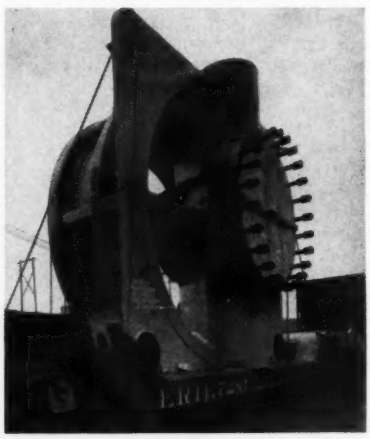


tive probing to a depth of 1000 ft. The detecting tube is securely housed in a waterproofed probe which is carefully designed to safeguard the instrument against careless handling. The probe is weighed so it will not float and tapered so that it will not catch on obstructions. Rugged construction makes the Counter suitable for subterranean exploration, and for scanning the sides of deep gulches and vertical rock walls for uranium.

Standard models are equipped with a beta gamma discriminating hand probe in addition to the deep hole probe and cable.

Bottom Shell for Crusher

Headed for the Mesabi Range in Minnesota and a multimillion dollar taconite project, this bottom shell for one of the world's largest gyratory



crushers is shown leaving the Allis-Chalmers plant in Milwaukee.

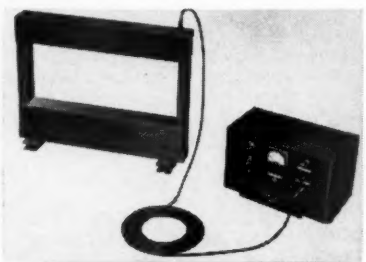
Weight of this single piece casting is 251,500 lb, while that of the assembled crusher will be 1,250,000 lb. When in operation later this year, the crusher will reduce any chunk of taconite that will enter its five-ft opening down to 10 in. or smaller at a rate of 3500 tph.

Two 60-ton cranes operating in tandem through a 130-ton equalizer bar were needeed to load the shell to a depressed center railway flat car.

Metal Detector

Dings Electronics, Inc., (Subsidiary of Dings Magnetic Separator Co.) announces a new low cost Metal Detector, built for both general industrial service as well as for mining service, where extremely deep burdens may be encountered.

The new "Universal Series" Metal Detector is said to be sensitive to all magnetic metals, immediately and automatically signaling their presence, and thereby protecting machinery and product quality against tramp metal damage. It is also said to detect some non-magnetics, such as manganese steel dipper teeth. Intensity can be adjusted to overlook non-magnetic belt lacings.



Further details may be had by addressing the manufacturer, 4740 W. Electric Ave., Milwaukee 46, Wis.

Air Starting Motor

Ingersoll-Rand announces a third size starting motor in its line of air starting units for diesel engines. This motor is known as the Size 5BM and is designed for starting service on gasoline engines with from 750 to 1750 cu in. displacement and for diesel engines with from 300 to 700 cu in. displacement.

For more information write Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

King Size Dynamite

New "King-Size" dynamite cartridges are now commercially available in four lengths, and small diameters, according to an announcement by the Explosives Department of Hercules Powder Co.

Commercial production of the longer cartridges has been made possible through the design and development of a machine for packing these cartridges in small diameters.

All Hercules cartridges are now available in these lengths: 24, 20, 16, and 12 in. The diameters are: 1¼, 1½, 1¾, and 2 in. The conventional eight-in. cartridge will continue to be available.

Hercules reports the new cartridges make possible more uniform fragmentation in the deeper blast holes which are being used in mining, quarrying, and construction and permit substantial savings in time and labor in loading blast holes.

Hoist Offered

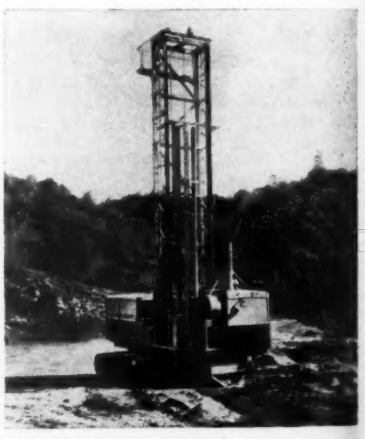
A light and versatile hoist is being manufactured by Griphoist, Inc., 700 Polk Street, San Francisco 9, Calif. The Tirfor Griphoist weighs 42 lb and has a nominal capacity of 3300 lb on a single line. With the use of

multiplying sheaves, loads of 6 to 10 tons can be handled. At full load, speeds of 10 fpm, cable travel can be obtained. The load can also be controlled in either direction to thousands of an inch, according to the maker, a very important feature when the hoist is used for machinery erection.

Rotary Blast Hole Drill

A rotary blast hole drill for putting down medium-diameter holes is now offered by Bucyrus-Erie Co. The new Model 40-R is designed along the same lines as the larger 50-R. It is available with electric or diesel-electric power and is equipped to drill 6¾ to 9-in. holes.

The crawler-mounted drill incor-

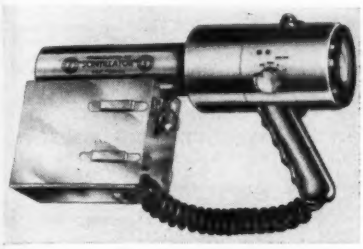


porates such design features as hydraulically powered down pressure on the bit; Ward Leonard electric control for rotation of drill pipe and for propelling; and air-blast cleaning of drill hole.

For further information, write Bucyrus-Erie Co., South Milwaukee, Wis.

Figures Uranium Content

Production of the Model 111B "Scintillator," has been announced by L. Norman, president of Precision Radiation Instruments, Inc. The new instrument features a special "percent" meter which, according to the company, will make it possible to determine percentage of uranium in ore at



the point of discovery. Formerly this could not be done until ore was chemically assayed.

The new Model 111B Scintillator weighs 7¾ lb and is designed for greatest possible mobility and portability. For further details write Precision Radiation Instruments, Inc., 4223 West Jefferson Boulevard, Los Angeles 16, Calif.

Strengthen Wire Rope

John A. Roebling's Sons Corp., Trenton 2, N. J., recently announced that developments in wire manufacture and rope fabrication now permit Roebling to announce a new line of wire ropes, with steel cores, having greater strength than that marketed heretofore. The new rope will be maunfactured primarily in preformed constructions. It will be obtainable in rope sizes ranging from ¼ to 3½ in.

In the past, one of the obstacles to rope of higher strength was a proportionate decrease in other qualities as the strength went up. According to the company, the new rope has higher resistance to wear from bending and abrasion, promising longer rope life.

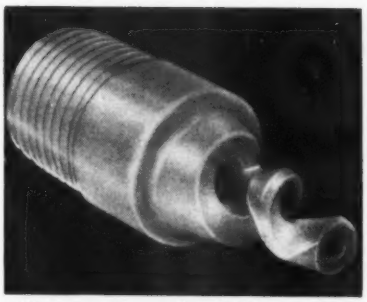
Riding Beats Walking

Latest addition to the Lee-Norse Company's (Charleroi, Pa.) line of mine Jeeps is the TJ6—a new low-type scooter. Developed to provide speedy transportation for mine personnel, mechanics and fire bosses, the TJ6 comfortably rides two men besides the operator. With a maximum trolley pole height of only 26 in., the TJ6 is for use in 30 to 48-in. coal. Weighing approximately 1200 lb it is powered by a three-hp motor.

For Water Sprays

A new line of Teflon spray nozzles has been announced by the Bete Fog Nozzle Inc. of Greenfield, Mass. The new nozzles are claimed to be non-clogging, corrosion resistant with practically any spray, long-wearing and inexpensive.

The new nozzles, called the "TF" series, are available in ten models



with narrow angle (50°) or wide angle (120°) hollow cone spray pattern in five different flow rates from 5 to 50 gpm. They are threaded with ⅜-in. or ½-in. male pipe thread.

— *Announcement* —

Edward T. McNally has been elected president of **The McNally Pittsburg Mfg. Corp.** of Pittsburg, Kan. to succeed his father, **Thomas McNally,** who

Thomas McNally

E. T. McNally

resigned recently to become chairman of the board of directors of the corporation.

Thomas McNally, founder of the firm, has been its president since its inception in 1912.

LeTourneau-Westinghouse Co. has entered into an agreement to purchase the plant and assets of **J. D. Adams Mfg. Co.,** Indianapolis, Ind., pioneer manufacturer of roadbuilding and earth-moving equipment, particularly motorgraders and traveloaders.

Atlas Powder Co. moved its general offices on February 11 from the downtown Delaware Trust Building, where it had occupied space for 34 years, to a new building of its own on a 45-acre tract about three miles from downtown Wilmington, Del.

Francis D. Holden has been appointed manager of sales of **Macwhyte Co.** Holden was assistant general sales manager before his promotion.

John Graham, general manager of sales for the **American Steel and Wire Division** of U. S. Steel, has announced the appointment of **Norman M. Sted** as assistant general manager of sales. In his new capacity, Sted will assist Graham in handling all general sales activities of the division.

The **Jeffrey Mfg. Co.** of Columbus, Ohio, has opened a western territory sales headquarters, it was announced by Lincoln Kilbourne, general sales manager of its Conveyor Division. **Stanley M. Mercier,** for the past 15 years chief engineer of this division in Columbus, Ohio, has been appointed manager with offices in the Flood Building at 870 Market St., San Francisco.

The **Frank G. Hough Co.,** Libertyville, Ill., manufacturer of Payloader tractor-shovels and towing tractors, has announced the promotion of **G. A. Gilbertson** and **R. L. Beyerstedt** to executive vice-presidents.

Managements of **Gardner-Denver Co.,** Quincy, Ill., and of the **Keller Tool Co.,** Grand Haven, Mich., have announced that the stockholders of both companies have approved a consolidation. Keller Tool Co. now becomes the Keller Tool division of Gardner-Denver and will continue operations under the former Keller management.

The election of **P. O. Peterson** as president and chief executive of **Mack Trucks, Inc.,** has been announced.

E. D. Bransome, formerly president and chairman of the board, continues as chairman.

Appointment of **M. B. (Jack) Crowley** as eastern regional sales manager of the Austin Division, **Central Ohio Steel Products Co.,** Galion, Ohio, is announced by O. C. Henkel, president.

Crowley was formerly associated with the Caterpillar Tractor Co., where he served as a special representative in the Mining Section of Caterpillar's Sales Development Division. In his new assignment, Crowley will be responsible for sales development of Austin Overshot Loaders in the states east of the Mississippi River.

See next page for Catalogs & Bulletins

CATALOGS & BULLETINS

ATLAS-COPCO EQUIPMENT CATALOG. *Copco Pacific, Ltd., 930 Brittan Ave., San Carlos, Calif.* Booklet CP-65 illustrates the complete line of Atlas-Copco equipment for mining and construction projects. Product coverage ranges from rock drills to the new Atlas all-purpose hoists. Also shown are Sandvik Coromant drill steels, extensions and detachable tunsten carbide bits; tampers, spaders, paving breakers and sheeting drivers.

B-E MOVIE. *Bucyrus-Erie Co., Publicity Department, South Milwaukee, Wis.*, has announced that circulating prints of the 16-mm sound-color motion picture, "That Extra Margin," are available. For further information about Bucyrus-Erie Film No. S-404 write to above address.

CEMENT AND CARBIDE MINING TOOLS. *Advertising Dept. Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa.* This is a new methods manual and catalog on cemented carbide mining tools. It describes a complete line of cutting and drilling bits for the coal industry, including various types of cutter bits, finger bits, roof bolting drills and coal drills. Reconditioning equipment and procedures for use on Carmet carbides are also recommended.

CLARKSON FEEDERS. *The Clarkson Co., 564 Market St., San Francisco 4, Calif.* Bulletins 540 and 541 describe the Clarkson Model E reagent feeders. Bulletin 540 describes the feeder in stainless steel and bulletin 541 describes the feeder in PVC for handling sulfuric hydrochloric and nitric acids of all grades.

INDUSTRIAL SAFETY EQUIPMENT. *Willson Products, Inc., Reading, Pa.* This is a fully illustrated general catalog designed as a workable, everyday safety manual. It is divided into four major sections—eye protection, head protection, respiratory protection, and welding.

SPUR-GEAR HOISTS. *Coffing Hoist Co., Danville, Ill.* This bulletin describes a line of spur-gear hoists and includes pictures, cutaway drawings, descriptions and specifications of 62 different sizes and models with capacities from ¼ to 25 tons. In addition to standard single and multiple-chain units, models for specialized applications are shown.

TUNGSTEN CARBIDE ROK-BITS. *Brunner & Lay Inc., 9300 King St., Franklin Park, Ill.* Bulletin B-1 is designed to help make selection of the right bit for the job a quick, easy matter. Two charts illustrate every Rok-Bit manufactured. Detailed recommendations are made for the use of every bit—thread type, size of drill steel and machine normally used, range of sizes with specific thread, etc.

URANIUM DETECTING INSTRUMENTS. *Fisher Research Laboratory, Inc., Palo Alto, Calif.* Theme of this bulletin is "Modern Instruments for Modern Prospecting." Among other things, it outlines the company's line of Geiger counters, scintillators and mineralights. A list of prospecting accessories is also covered.

Index to Advertisers

	Page
Allis-Chalmers Mfg. Co. General Machinery Division	Third Cover
Allis-Chalmers Mfg. Co. Tractor Division	2-3 and 17
American Brake Shoe Co. American Manganese Steel Division	47
Ammann Photogrammetric Engineers, Inc., Jack	79
Barber-Greene Co.	78
Bethlehem Steel Co.	21
Bowers Battery & Spark Plug Co.	72
Bucyrus-Erie Co.	10
Centrifugal and Mechanical Industries, Inc.	74
Crucible Steel Co. of America	8
Deister Concentrator Co., The	75
Denver Equipment Co.	20
Detroit Diesel Engine Division General Motors Corp.	9
du Pont de Nemours & Co., Inc., E. I.	22
Electric Storage Battery Co.	14
Engineers Syndicate, Ltd.	78
Fisher Research Laboratory, Inc.	76
Flood City Brass & Electric Co.	74
General Mills, Inc.	1
Greensburg Machine Co.	71
Hercules Powder Co.	15
Jeffrey Mfg. Co.	12-13
Joy Mfg. Co.	7
Kennametal, Inc.	65
Loftus Corp., Peter F.	70
Mahogany Importing Co.	80
Mine Safety Appliance Co.	Fourth Cover
Mott Core Drilling Co.	84
National Carbon Co.	16
National Electric Coil Co.	40
New Mexico Copper Corp.	77
Ohio Brass Co.	11
Pattin Mfg. Co.	Second Cover
Pennsylvania Drilling Co.	84
Read, Davis	70
Roebling's Sons Co., John A.	41
Sanford-Day Iron Works	18-19
Standard Oil Co. (Indiana)	4
Timken Roller Bearing Co.	6
Universal Vibrating Screen Co.	76
Woomer & Associates, J. W.	70

CORE DRILLING
ANYWHERE
We look into the earth
PENNSYLVANIA
DRILLING COMPANY
PITTSBURGH 20, PA.

CORE DRILLING
CONTRACTORS
DIAMOND CORE DRILLING FOR COAL, CLAYS and ALL MINERALS
FOUNDATION TESTING
HIGH PRESSURE GROUTING FOR MINE SHAFTS, DAMS and BUILDINGS
LARGE DIA. HOLES FOR DRAINAGE

MOTT
CORE DRILLING CO.
Huntington, W. Va.

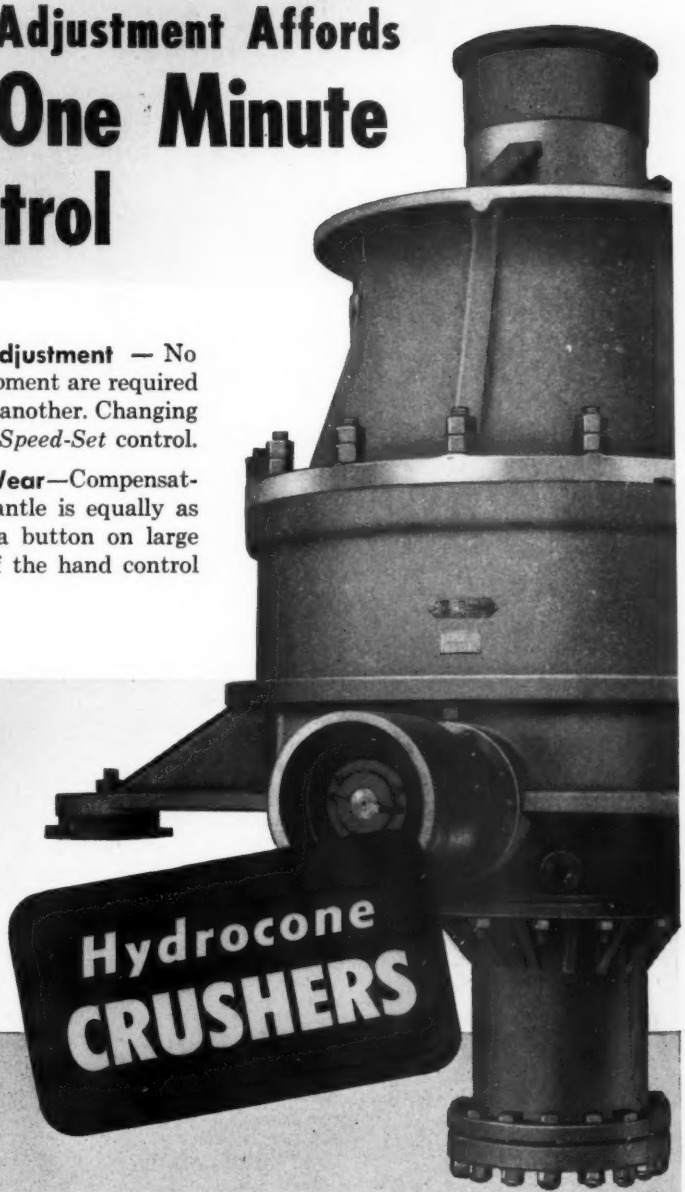
Speed-Set Hydraulic Adjustment Affords

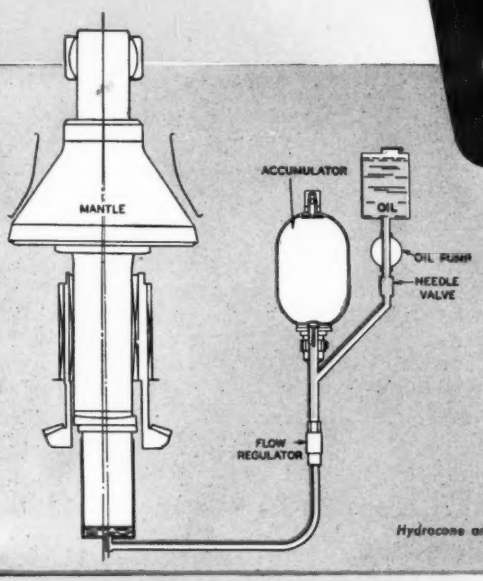
One Man...One Minute Product Control

Quick, Accurate Product Size Adjustment — No dismantling and no auxiliary equipment are required to change from one product size to another. Changing is instantaneous and precise with *Speed-Set* control.

Simplified Compensation for Wear—Compensating for wear on concaves and mantle is equally as fast and convenient. A push of a button on large *Hydrocone* crushers or a move of the hand control on smaller sizes does the job.

Fast Emergency Unloading and Tramp Iron Protection — If crusher stops abruptly because of power failure or other emergency, *Speed-Set* control facilitates fast clearing of crushing chamber.





How *Speed-Set* Control Works

Mainshaft assembly is supported on hydraulic jack. Oil pumped into or out of jack raises or lowers crushing mantle.

When tramp iron enters crushing chamber, oil from jack is forced into accumulator, allowing mantle to lower. Automatic reset returns cone to original setting after tramp material is passed.

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 07B7145B.

A-4478

Hydrocone and Speed-Set are Allis-Chalmers trademarks.

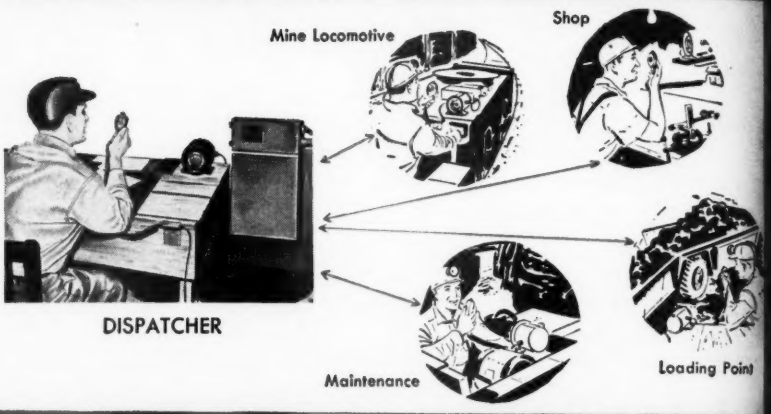
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Increase Your Production and Mine Safety with these M·S·A Communication Systems

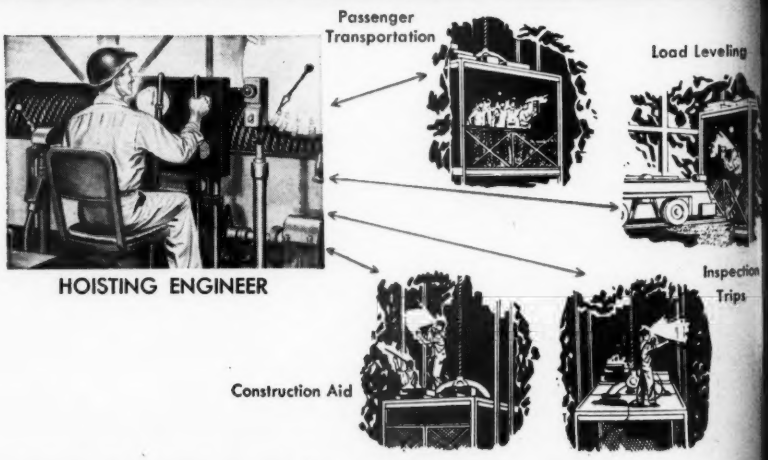
MinePhone

The M.S.A. MinePhone is eliminating communication delays in many modern mines everywhere. This clear, instant two-way voice communication system coordinates the wide variety of operations vital to peak production. Haulage moves faster because dispatcher and motormen are constantly in touch, even while trips are in motion. Shop and maintenance personnel are always "on call" to keep mining equipment in operation. Because messages are relayed instantly, on an open-line hook up, the MinePhone brings an added measure of safety to all operations. Write for details.



HoistPhone

The M.S.A. HoistPhone provides continuous, dependable and efficient voice communication between hoisting engineer and cage, at any level, and when in motion. The system is invaluable in emergencies, yet designed for day-in-day-out service. Ideal for passenger travel, load leveling, inspection trips, and construction work, the HoistPhone requires no special training; utilizes existing wiring. Write for complete details.



MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At your service: 77 branch offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.